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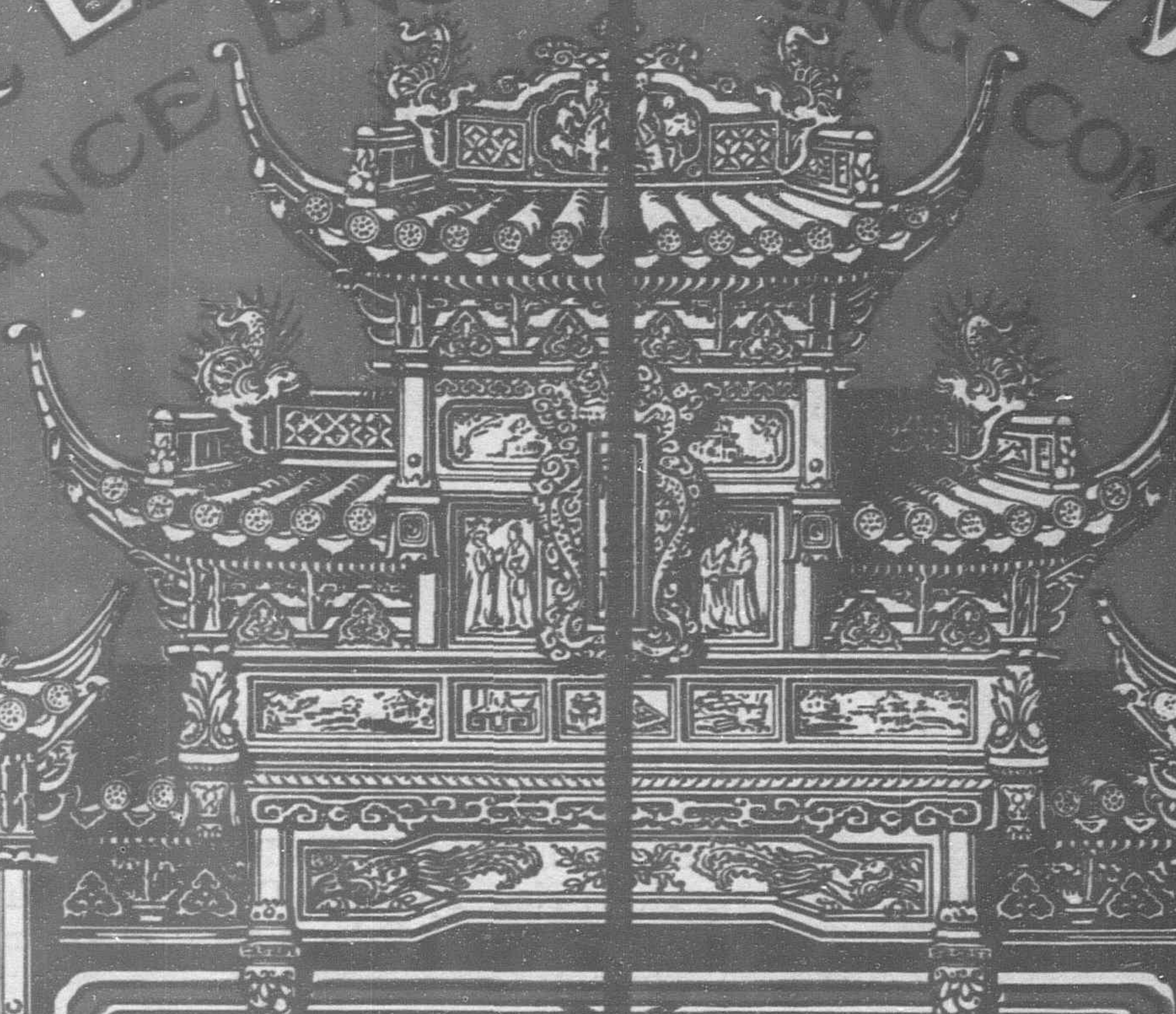
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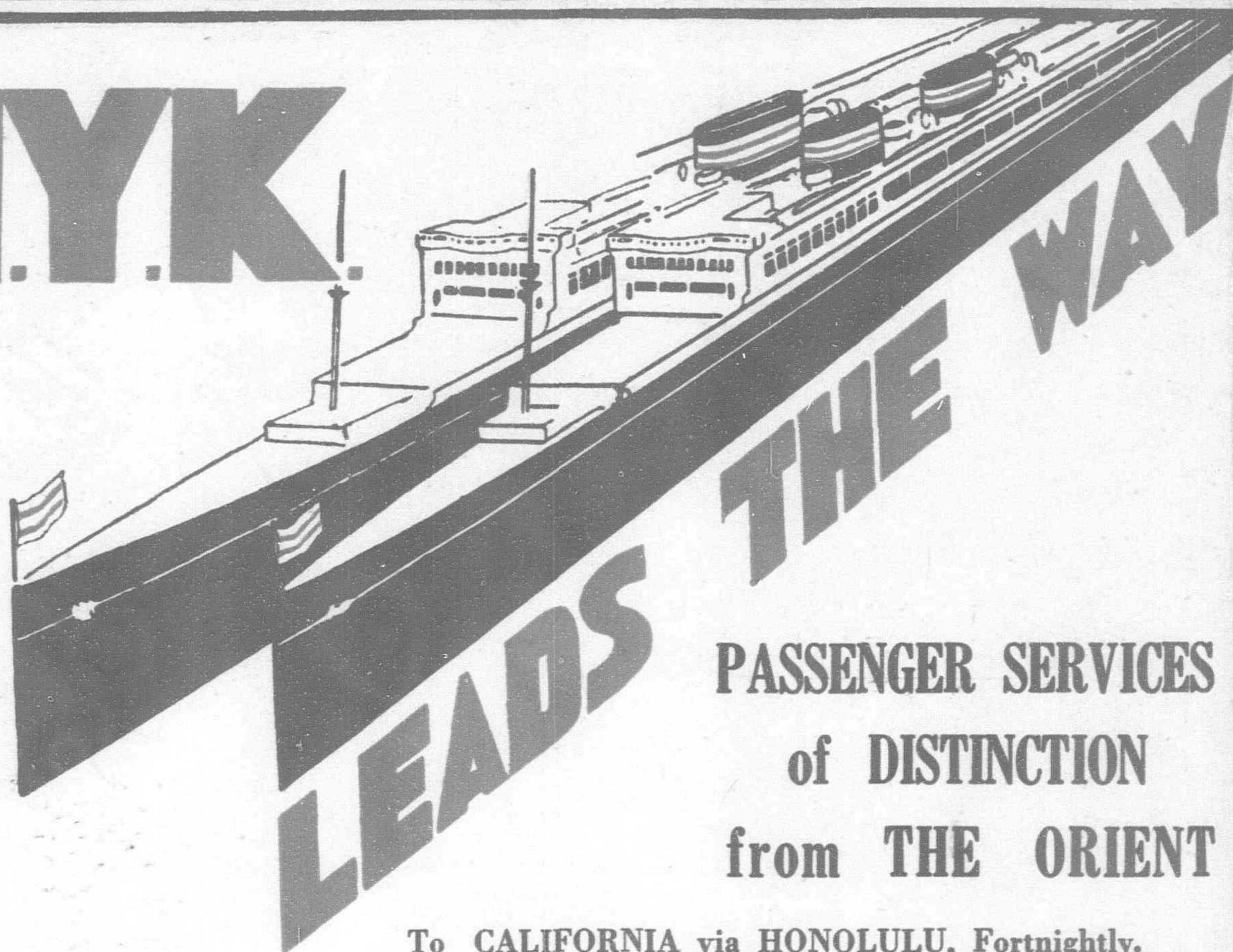
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The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XXVI

SHANGHAI, APRIL, 1930

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The Reconstruction of Tokyo and Yokohama

ON September 1, 1923, Japan was visited by one of the most startling and calamitous earthquakes of modern times. Within a few hours, from earthquake and subsequent fires, Yokohama was completely wiped out and Tokyo was a mass of ruins. The labor of fifty years of a brave and energetic people was brought to a halt and the accumulated wealth of a great nation wiped out. What remained, however, was the indomitable will to survive and to maintain a place in the sun, the spirit which transformed a small island kingdom into the third greatest Power on Earth, the spirit which sent the sons of Nippon to the plains of Manchuria twice to shed their blood for independence from the imperialistic designs of Czarist Russia, the spirit which to-day is making of Japan a self-sufficient industrial nation, a supplier of engineering materials to Asia. It was this spirit which aroused the Japanese people on the morrow of the earthquake to a sense of the necessity for immediate reconstruction. Perhaps nowhere in history is there evidence of such a capacity to wipe away the tears of shock and disappointment with rapid and stoic determination, and to set about to rebuild a new and a better era.

The June-July, 1925, issue of the *Far Eastern Review* was entirely devoted to the reconstruction of Tokyo and Yokohama. In 534 pages of engineering articles, the entire plan of reconstruction, every phase of it, was fully discussed in an issue of this journal which was correctly entitled, "Reconstruction Number—A Monument to the Japanese Engineer." Forthcoming issues of the *Far Eastern Review* will complete the record by publishing the results of this vast engineering effort, the completion of the plans made after the Earthquake.

The hugeness of the task can perhaps in no better way be indicated than in terms of expenditure. The Japanese Government alone appropriated Yen 573,438,849 for purposes of the reconstruction of Tokyo and Yokohama. The cities of Tokyo and Yokohama and the prefectures in which they are situated spent in addition Y.193,179,475. To this must be added the hundreds of millions of

Yen spent by private individuals and corporations in the rebuilding of their own homes, offices, industries, etc. which were destroyed on that fateful day—it is estimated that approximately one billion and a half yen will cover the cost of the earthquake.

The Japanese people, the people of Tokyo and Yokohama, in particular, are to be congratulated on the successful termination of their reconstruction work. On March 24, more than a million subjects of H.I.M. the Emperor of Japan, lined the streets of Tokyo, as the Emperor spent five hours inspecting the work of reconstruction, the first event to mark the three days' celebration of the completion of the reconstruction of the city of Tokyo. As a new city of steel and granite rises on the ruins of old Tokyo, the whole world remembers in sympathy and friendship, the 58,000 men, women and children who lost their lives during the disaster and the million and a half other sufferers, many of whom must remain maimed for life. Although their lives were sacrificed, their country has continuously made marked strides of progress; although in the first moments of the earthquake, hope seemed to be lost, Japan is to-day as great and as mighty as before September 1, 1923.

It is at a moment such as this, that the friends of Japan realize that the greatness of Japan comes not alone from a capacity to adapt the materialistic civilization of the West to the needs of the East; Japan's greatness rises from causes which transcend East and West—it rises from the soul and spirit of a people who face the necessities of life bravely, without cringing, without fear, without petulance, who labor and toil to find equality, not with all peoples but with the greatest of peoples. The reconstruction of Tokyo and Yokohama opens to Japan a new era, the era of universal friendship and respect. Japan is no longer feared; Japan is becoming loved and respected. Perhaps the suffering and fire of the earthquake and its frightful aftermath wrought even more marvellously than we know, for it is surely an interesting coincidence that the end of the period of reconstruction synchronizes with the signing of the Three Power Pact between the United States, Great Britain and Japan—the emblem of peace in Asia.

Modernization of the Chinese Government

A Study of Ideas and Methods Based Upon the Annual Report of Mr. T. V. Soong, Minister of Finance

By GEORGE E. SOKOLSKY

LIKE Alexander Hamilton's "Report on Manufactures," Mr. T. V. Soong's "Annual Report for the Fiscal Year, July 1928 to June 1929," published in the last issue of the *Far Eastern Review*, establishes a theory of national finances and lays the foundation for reconstruction. It points a way which anyone can follow. It transcends the narrow limitations of party and clique groupings and indicates how the finances of China are to be the basis for the modernization of governmental processes and how systems devised by the present Minister, but inadequately implemented because of political and military conditions, may be utilized by any Minister, functioning with any political group, for the betterment of government administration. And

finally, he indicates that the effective impediment to modern administration and to unification and stabilization is the constant and sudden resort to arms by dissatisfied militarists, who acknowledge no national requirements save their own continuation in feudal tenure of tax-ridden, disorganized territorial units, often as large as European countries. Mr. Soong dares speak frankly and truthfully; he dares even gainsay the painful propaganda of those who insist that China is already completely unified in the face of months of fighting each year and in the face of an inability of any central group to make its writ run in vast areas of the country. He dares avoid the bogey of letting the foreigner know what is actually happening in China (which, of course, they really know through

diplomatic and consular officials, business men, missionaries, tourists, newspapermen and countless agencies of observation); rather does he prepare a report for home consumption in which he tells his countrymen exactly in what direction their country is moving and what might be its goal if civil strife were avoided. In doing this, Mr. Soong has performed a lasting service to China, which will be better appreciated by the historian of the future than by the narrow partizanship of the moment.

I

The question often arises: Why should anyone seek to unify under one administrative unit the whole of so vast a continent as China? Perhaps more advantageously, the question might be framed as to whether any one central authority has been able to unify this vast country under its authority. In almost the opening paragraph of his report, Mr. Soong describes the authority of the Nanking Government during the period under review:

With the fall of Peking by the Summer of 1928 the country was to all appearances, and in some phases, actually unified. But for the purpose of national finance, Szechuen, Yunnan, Kweichow, Shansi, Jehol, Suiyuan, Chahar, Shensi, Kansu, Sinkiang and the Three Eastern Provinces were, and still are with the exception of the Customs revenue, outside of the actual control of the Ministry of Finance. And it was not till late in the Spring of 1929, when Hankow was taken by Government forces, that the provinces of Hupeh and Hunan came under the financial control of the Government; it was not till the Summer of 1929, after the war in the South, that Kwangtung and Kwangsi became integral parts of the national authority; and it was only in the Summer of 1929, after the withdrawal of Japan and the retirement of Marshal Feng Yu-hsiang, that the national receipts and expenditures of Shantung and Honan came under the direct administration of the Ministry. These are the more clear-cut cases, but even in Kiangsi and Fukien financial control by the Ministry became a reality only towards the end of the fiscal year.

It must be accepted that the area in which the full authority of the National Government is finally recognized is the area in which it is possible for its Ministry of Finance to collect revenue. Militarists may give, for a consideration, lip-service to the national authority, but no measure can as definitely and indubitably fix authority as the ability to collect revenue. If then this test should be applied to Mr. Soong's statement, the authority of the National Government has extended, at any time, over a comparatively small part of China and therefore the assumption might be accepted that the National Government has failed to make itself the representative of what foreigners have been pleased to designate as China. Yet, such an assumption would be wholly misleading, is and has been misleading. Almost all foreigners think of China in terms either of a centrally unified country under an absolute, despotic emperor or of a gelatinous chunk of the earth where political form and substance is unattainable because the people lack political capacity. Either judgment represents a glib generalization, far from actualities. China is a country in which the people are culturally, socially, spiritually, even in economic processes, united by century old bonds which grow increasingly stronger as the spirit of nationalism permeates every element in society, even the peasantry. China is also a country which has suffered the shock of revolution, due to a sudden and powerful impact with novel political ideals and economic processes arising in the West, and which is therefore experimenting with adaptations and adjustments, far-reaching in their implications and intentions. This experimental period is chaotic, as such periods must be, because there is a natural confusion of purpose and ideal, and leadership is not wholly recognized because it receives its sanction from no body beyond its own will. This process of unification of the mass and disintegration politically, occurring simultaneously, involves China in curious paradoxes. When a Kuomintang spokesman says that China is unified, while the machine-guns play a tattoo almost within hearing of the national capital, he is not altogether untruthful nor quite mad. For, the unity of spirit is evident in every phase of Chinese life, except in political organization and administration. When a national athletic contest was recently held in Hangchow, Chinese boys and girls from all parts of the country participated, without regard to regional political differences. Should an educational, a medical, a religious conference be held, exactly the same phenomenon will be evident, namely, that the entire region known on the map as China, including Manchuria and Turkestan, but not Mongolia and Tibet will be represented. But should the Nanking Government attempt to hold a disbandment conference, or a political meeting of any nature, only those will attend who recognize the political authority of Nanking or who, for the moment, may be allied to that authority.

Two central ideas enter into this question of what might be termed social unity and political disunion: First, there is the undoubted fact that traditionally the Chinese people are not politically minded and that therefore politics, law, administration do not interest and concern them as much as social and cultural relationships. Most of the present political and legal forms which politicians seek to impose on China came either from the English-speaking countries, France or Soviet Russia; that is, they are alien in character and structure to the Chinese people, who can no more accept and assimilate them readily than the United States could quickly readjust to a system evolved, let us say, in Japan. Even the Sinofied adaptations which Dr. Sun includes in his Five Power Constitution are not sufficiently Chinese to grip the popular imagination with that swift assurance which makes for success in political processes. Instead, the people turn from politics to cultural and social questions and leave politics to the politicians and the militarists, who gradually get out of touch with their own people and move in a realm wholly un-Chinese. These temporary political conditions makes for wars, chaos and perhaps give the Communists an opportunity to stir the masses to a greater discontent, but the Chinese people can only achieve political consciousness and ability through their own experience and that experience cannot apparently be gained without a long period of trial and error, costly errors, in the course of which the race is being rejuvenated and the social and cultural processes channelled modernly. The future of China is bright indeed, if only those who see the confusion, could look beyond it.

China politically falls into definite regions which are formed by historical and geographical forces working through military operations. These regions or zones may be described roughly as follows:

Zone A.—The territory controlled by the National Government, bounded on the North by the Yellow River, on the West by Szechuan, on the South and East by the Sea and the Indies. In this Zone, there are always uncertain regions, like Kuangsi, Kueichow and Yunnan or the Communist holdings on the borders of Fukien, Kiangsi and Hunan. But roughly, this description approximates the experiences indicated in Mr. Soong's report.

Zone B.—This is a "Grey" region, extending along the Yellow River and including parts of Shantung, Honan, Shensi, and Kansu.

Zone C.—The Northern region, dominated at present by the province of Shansi and including the old metropolitan province of Chihli, now called Hopei, and including the ancient city of Peking now called Peiping. Also the un-Russified parts of Mongolia.

Zone D.—Szechuan and the Tibetan Marches, now called Sikong, which are too distant, for the moment, to be included in any other grouping.

Zone E.—Sinkiang, which is Chinese Turkestan and which debouches economically into Soviet Russia more readily than into China.

Zone F.—Manchuria which is having a development of its own and which tends, in political matters, to a neutrality favorably motivated towards Nanking.

Mongolia has, on the whole, become a Russian province and Tibet is a unit that need not be considered at the present time.

In a calculation I made recently of Zone A., I found that if, to strike a fair average, it included positively, Kiangsu, Chekiang, Anhui, Shantung, Fukien, Kiangsi, Kuangtung, Kuangsi and Hupeh, it covered an area of 448,578 square miles and was inhabited by approximately 215,727,027 human beings. (If Shantung were omitted, Hunan might be included, but to avoid an indictment of partizanship, I left out Hunan, Yunnan and Kueichow, which might shift all over the place in any actual zonification of the country.) This area is approximately as large as France, Germany, Denmark, Belgium and the Irish Free State put together and it has a population nearly half of the total population of China. Its revenue from the Customs alone amounts to about 66 per cent. of the total. The city of Shanghai, which is its economic capital, contributes about 46 per cent. of the total revenue of the country. Of the 15 cities of China having a population of more than 200,000, 11 are in Zone A.; of the 120 cotton mills, 96 are situated here, 59 being in the city of Shanghai. Although much of this region is rice-eating, of the 193 flour mills in China, 83 are definitely situated in these provinces. One can go on indefinitely: tobacco factories,

silk filatures, electric light and power plants, shipping, banking—practically speaking, the liquid wealth and the industrial power of China is concentrated principally in Zone A., with which Manchuria alone may be regarded as even approaching competition. The political capital of Zone A. is Nanking; its economic capital is Shanghai, which with Canton and Hankow, form the basic centers of the economic life of China.

Is not such an area a large enough and important enough region for any Government to control and to develop? That is the fundamental question which Nanking must solve at the present time. It cost Nanking approximately \$500,000,000 to try to hold the province of Honan during the past two years. The result is that Honan is in the Grey Zone, held by free-booting militarists whose very existence apparently retards the development of Zone A. which has to be taxed not for reconstruction but for mere self-defence. Of course, a modern mechanized army could defend the frontiers of Zone A. from depredation by the bandits of the Grey Zone inexpensively and sufficiently. That may be a temporary solution for China's political arrangements, which will provide a recess from civil warfare for Zone A. until such a time as reconstructive processes shall have been launched and shall be functioning with such effectiveness that Zone B. will be clamoring to be admitted into Zone A. on any terms whatsoever. And of course, the single term will be the disbandment of all armies and bandit corps in Zone B. by the agents of Zone A. This is a long process but a necessary one, if China is to be saved from the downward pull of backward provinces.

Now, the error that the foreign Powers have made has been to demand of China unification and stabilization over a vast geographical area which is only called China on maps printed in foreign languages. In a word, the Powers say to China that it may be true that in half of your country you are rapidly advancing to modern European conditions, but in Shensi and Kansu and Sinkiang, you are in the 13th century; therefore, we must regard the whole of China as being in the condition of Shensi, Kansu and Sinkiang. Therefore, such economic assistance as is given to Turkey, for instance, which is about one-half the size of Zone A. should not be given to Zone A. although it shows sufficient stability to finance several hundred million dollars of domestic bond issues and is creating a modern industry in textiles, ship-building, tobacco products and electrical supplies, which cannot be ignored any longer. Even if the Chinese resent the idea of Zoning because it implies that lack of unification which they dread most in its international implications, it is impossible to ignore zoning in the economic development of the zones. Zone A. and Zone F. are going through an economic development which must be recognized by international capitalism; the other zones are still backward and form, for the most part, an economic hinterland for these two Zones. This economic difference in the Zones must be reflected in political conditions in each of them and through the country and must affect international attitudes and relationships. For instance, Japan's economic and therefore political associations with China are, for practical purposes, limited to Zone A. and Zone F. while Soviet Russia has practically been excluded from Zone A. and Zone F. except as its hold on the Chinese Eastern Railway continues.

II.

Various analyses have been made of China's difficulties and the causes which underlay the inability of any Chinese Government swiftly to organize an adequately modern and efficient administration. Most of the studies on this subject commence with a prejudiced view that the Chinese people are incapable of producing an honest and effective administration, but such views are historically absurd, for in the past China has had administrations which were efficient and honest in accordance with the practices of the period. Mandarinism, *per se*, is no more evil a system than the permanent civil service in Great Britain, which somehow always muddles through and which has, in spite of its bureaucratic slowness and avoidance of brilliance, formed a remarkably well-administered Empire. The fault of Mandarinism lay, not so much in the system, as in its lack of intellectual flexibility. For instance, the Sino-Japanese War was indisputably lost because Mandarinism was unable to understand the difference between a Chinese war-junk and a modern cruiser. The Li-Lobanoff Treaty would not have been written and the Russo-Japanese War might not have been fought on Chinese soil, were Mandarinism capable of grasping the import to China of the

new international relationships which the Battle for Concessions was thrusting upon China. Mandarinism decayed and eventually died because it was conceited and inflexible. Towards the end, it was incapable of learning anything new. It devoted itself merely to the polishing of puns and metaphors, which may be lovely in an academy but which can never produce a modern Government.

But Mandarinism had this virtue that rank it in came by a civil service examination and that any person could rise from the lowest origins to the highest position in the administration of the Government. In theory, Mandarinism was democratic and prevented a senile aristocracy from impeding progress. Nevertheless, during such periods of stress and decay as marked the Taiping Rebellion, Mandarinism suffered from the sale of offices, so that not trained minds, not scholars and experts, assumed public office, but less competent personages who managed to buy their way to preferment. There can be no question, however, that the civil service system, which was the particular characteristic of Mandarinism, was one of the most remarkable devices of government and that its universal adoption to-day is a monument to the science of government in China.

Dr. Sun Yat-sen realized this and placed the civil service on an equality with the executive, legislative and judicial arms of the government. In this Five Power Constitution, the importance of the civil service is emphasized. Two impediments have been in the way of the restoration of this system: one, the constant civil wars; the other, the necessity of rewarding members of the Kuo-mintang who had sacrificed themselves in the cause of the revolution. The time has now come, however, when it is urgent for the government to restore the civil service, for the essential governmental problem facing China to-day is the weakness in administration as regards both personnel and routine. Every agency of the Government is poor in personnel and almost infantile as regards procedure, methods of administration, the routinization of governmental functions. The old systems of Mandarinism have broken down; the new systems of modern statecraft have not been instituted because there is not an experienced permanent service which can handle the routine. With regard to this subject, Mr. Soong's comments are particularly interesting:

Another anomaly which is being remedied is the discrimination which has existed against Chinese in the higher ranks of the Customs service: for fifty years no Chinese reached the rank of Commissioner of Customs. The principle has now been laid down that promotion is based solely on merit and that there will be no recruiting of foreigners for the service except for technical work under the direct instruction of the Minister of Finance. At the same time the Customs is recruiting more highly trained Chinese into the service, and during the year graduates of universities abroad have been admitted after careful examination. Further, with a view to improving the standard of our nationals in the higher ranks, several present members of the Customs Administration, who are already graduates of colleges in China, have been sent to England and America to study the Customs administrations there.

Since the inauguration of the new policy of the Government, which has been loyally observed by the present Inspector-General, one Chinese has become a full commissioner, seven have become acting commissioners, one has become a deputy commissioner, and eight have become acting deputy commissioners. The general result of the policy has been a more harmonious working together of all nationalities in the Customs service, and the smooth transition on February 1, 1929, from the flat five per cent. tariff to the more complicated new graduated tariff is itself a proof that the Customs Administration is functioning efficiently.

During the storm and stress of the Northern Expedition and the ensuing period of almost incessant military activities, the Ministry of Finance, like all Government institutions, had perforce to be content with getting whatever personnel that was immediately available. Careful selection of experienced administrators was, for the most part, out of the question.

The important task of installing an effective civil service system, which after all is the only genuine and lasting remedy for centuries of malpractices and actual corruption among Government officials, has now devolved upon the newly-organized Examination Yuan.

Pending the inauguration of the general plan of civil service reform under the auspices of the Examination Yuan, the Ministry of Finance has been trying to maintain and extend whatever basis for a civil service system that already exists among its departments. The Ministry has been jealously guarding the civil service traditions of the Maritime Customs and has further given over to the control of that service the most important inland Native Customs, those at Wuhu, Yangyu and Fengyang.

In the Salt Inspectorate the same policy has been adopted: in fact, the main reason for the resuscitation of the Salt Inspectorate by the Ministry was because of its well-conceived civil service system and its trained personnel. At present the Salt Inspectorate has been given full control not only of the collection of the duty proper, but is also charged with the collection of all local surtaxes of whatever nature. The civil service system has also, in some measure, been introduced into the

Rolled Tobacco Tax Administration, which is the third most important revenue department. Appointment and promotion in the Rolled Tobacco Tax Administration has become a matter of routine, and a change of the head of the Administration was not attended by any change in the general staff.

The problems presented in the above statements are most interesting. How can an honest, effective administration be organized when there cannot be "careful selection of experienced administrators?" But the fact also remains that in several departments of the government efforts have been made to establish trained personnel. This is true not only of the Ministry of Finance, but also in other ministries and in provincial and municipal governments, particularly where engineers and other experts must be employed if any work is to be done at all. The all-embracing Chinese scholarship, that is, the assumption that because a man can read the classics and write an essay about them in accordance with a stylistic tradition, that he can do anything and understand everything under the sun, is giving way to the recognition of the fact that certain specific jobs must be done by especially trained experts. There is still, in China, too great a tendency for men to function in fields which they cannot understand; there is still a lack of comprehension of the principles of the delegation of authority and the division of labor, but conditions to-day, in this respect, are far superior to anything that has been witnessed here before.

III.

Finally, one reaches the very interesting problem of China's international relations as is evidenced by her financial policy. To most Chinese and to many foreigners, the principal factors of China's international relations are the problems of extraterritoriality, inland shipping and the status of the city of Shanghai. As important as these questions may be, they are not quite on a plane with the problem of taxation, of the legal opportunities to trade on an equal basis and the re-establishment of China's national credit. For certain facts are outstanding and can under no circumstances be disregarded. The primary interest of foreigners in China is a trade interest. Foreigners come to China to trade; foreign bankers are interested in China because of the possibility of financing trade and industry; foreign manufacturers and industrialists are concerned with China because of the possibility of purchasing raw materials here and the sale of manufactured goods. With the exception of Japan's position in Manchuria, there is no outstanding international problem concerning China which does not hinge upon trade. And trade seeks two guarantees: one is equal opportunity for everyone; secondly, equality of the amount and in the administration of taxation. Equal opportunity means that under the law there shall be no distinction as among nations and their nationals, so that everyone goes into the market on an equal competitive basis. In China, there is a tendency to make a distinction between native and foreign goods, but by native goods is not always meant goods produced in China but rather goods produced by exclusively Chinese capital. This means that goods produced of Chinese raw materials by Chinese labor but with foreign capital might be regarded as foreign goods. This curious doctrine arises from the struggle between the Chinese people and what they term foreign imperialism.

China's industries, however, are so much in their infancy and there is so little liquid capital in China, that any Government which seeks to develop industry, must also seek foreign capital. Foreign capital cannot come into China as long as this distinction between so-called native and foreign goods continues to be applied, for capital insists upon equality of opportunity under the law. Furthermore, foreign capital cannot come into China in large amounts, even for private purposes, until the defaulted loans of the Government have been satisfactorily liquidated, for the credit of no organization in China can be better than the credit of the Chinese Government which guarantees its integrity under its own legal systems. Mr. Soong has met in problem in two respects: First, as regards taxation, he has provided a machinery for absolute equality of treatment; secondly, as regards the defaulted indebtedness, he has created a machinery and has stated a principle for their liquidation. In his annual report, he states these facts as follows:

Taxation.—When the oil companies found that the consolidated tax system meant a uniform tax collected at the source and afforded them immunity from petty annoyances, they responded whole heartedly in spite of the relatively high rate of tax imposed. It was with the revenue from this tax that a large bond issue was floated to carry on the Northern Expedition.

In January, 1928, an agreement for a consolidated cigar and cigarette

tax was arrived at with all the companies, whereby for all cigars and cigarettes of domestic or foreign manufacture, in addition to the Customs duty on foreign imports, a consolidated tax of 22½ per cent. was imposed. After several months of protracted negotiations with local authorities and organizations, the scheme was successfully carried out wherever the Ministry of Finance had direct control. Here again, when business men found that a tax was administered with impartiality and collected once for all, the responsible companies gave the Government every co-operation. By January 1, 1929, the tax was increased to 32½ per cent. for domestic manufacture and 40 per cent. for imported goods. The result of the tax has been very gratifying; as against the few hundred thousand dollars monthly receipts that used to be collected by every means throughout the country, the receipts from the provinces, where collections are made by the agents of the Ministry of Finance (exclusive of the Three Eastern Provinces, Shansi, the Northwestern and Southwestern provinces) have now reached almost four million dollars monthly despite the recrudescence of civil war.

Re-establishment of Credit.—DOMESTIC AND FOREIGN UNSECURED INDEBTEDNESS.—Although during a great part of its life, the Government has been confronted with the mere task of defending its existence, it early realized the importance of dealing with the problem of the national indebtedness in arrears, and created a special Commission, consisting of the Chairman of the Executive Yuan and the responsible Ministers, to study the problem of its unsecured indebtedness. Much progress has been made, and it is expected that during the present year it will be possible to formulate some scheme of debt consolidation to the bondholders. As an earnest of its intentions the Ministry has been setting aside the sum \$5,000,000 annually to go towards the final scheme of liquidation.

The suggestion has often been put forward that the Ministry should attempt to obtain financial assistance by means of foreign loans, but it has been its policy studiously to avoid even negotiations in this direction, until there was assurance that the terms and conditions which could be offered prospective foreign purchasers of our bonds would be such as could be accepted and yet which would not imperil China's financial integrity. It has been the task of the Ministry during the past year to study the problem of China's indebtedness and to seek a formula for the consolidation of the entire public debt under the Ministry of Finance, so that a plan could be devised for sound public financing in the future on a basis honorable to China and satisfactory to prospective bondholders. At the same time the Ministry cannot emphasize too strongly that the process of restoring national credit is so painful and costly that no department of the Government should enter light-heartedly into engagements for which it is not fully prepared to shoulder responsibility. A mere suggestion that new obligations entered into by any branch of the Government are not fully lived up to is enough to reflect on the whole of China's credit abroad. Obviously as national credit concerns the entire Government, it must be dealt with as a whole.

Recognition was early made of the use to which the Salt Inspectorate with its civil service traditions and experiences in salt administration might be put, despite the low estate to which it had fallen and the popular opposition to what was considered an anti-Nationalist collecting agency of the creditors. On September 26, 1928, the National Government issued instructions whereby the service of the salt loans was directly charged to the Minister of Finance and the Salt Inspectorate was made an integral division subordinate and responsible solely to the Ministry of Finance. At the same time, it was provided that the Salt Inspectorate Service should be restored throughout the country, but that where the revenue could not be remitted to the Central Government, at any rate a fixed quota of the revenue, sufficient to pay for an apportioned share of the loan service as a first charge, should be remitted to the Treasury. This quota plan, after some preliminary difficulties, eventually succeeded, and by this scheme a total equivalent to \$9,600,000 was paid to the foreign bondholders during the year 1929. By September, 1929, the scheme had proved so successful that the Ministry was able not only to announce provision for payment of one year's obligations annually, but also to adopt plans to clear the arrears.

IV.

The vital significance of Mr. Soong's report is that he is absolutely frank in stating the shortcomings of his Government and its administration, but he is optimistic as to the future, because he envisages a situation wherein there will be sufficient peace in a sufficiently large area to be able to apply modern methods to administration. In spite of the constant reports of civil wars, there has been, during the past year, peace in this huge area which I have denominated as Zone A. This area is so enormous that its modernization would strain the ability and energy of the best minds of any country. It is an ample job for any man and the accomplishment of success would redound to the credit and glory of any administrators. It is true that its size is nothing like the vast empire of the Tang Dynasty or of Chien Lung, but the emperors of those days were not concerned with the intricate international, social and economic problems which face a modern Government. Their governmental principle was quite simple; as long as the people paid their taxes and there were no rebellions, let the people alone. And the people regarded themselves as particularly fortunate, if an Emperor did not increase the taxes or abuse the people. But to-day, the people of any country, including China, want much more than such negative

(Continued on page 158).

The Turkestan-Siberian Railroad

In the Heart of Asia—on the Frontier of China

FEW developments in Central Asia attract attention anywhere in this world, because Central Asia is so far away, is so much a desert, is inhabited mostly by nomads, that the assumption is natural that it does not matter. A railroad in Central Asia—how can it affect the rest of mankind? Yet there has probably been no railroad development anywhere in the world since the building of the Trans-Siberian Railroad which is of equal political and economic importance. Linking with the Trans-Siberian Railroad at Semipalatinsk, the new Turkestan Siberian Railway forms a link of an arc which surrounds China on her northern and north-western frontiers. Whereas formerly Russia could move troops eastward only on the Trans-Siberian Railroad, a single tracked line, after April 28, when the new line is opened, there will be two railways for military purposes, for the new Turkestan-Siberian Railroad connects at Lucovaia with the European lines through the Caucasus. As Anna Louise Strong put it:

What does its opening promise? A far swifter expansion than followed the driving of any of America's railways. This opens no mere unsettled lands; it touches many lands—of incredible wealth in copper, lead and zinc—already settled by ancient peoples. The wheat of Siberia, which formerly in good years rotted for lack of transport, and the timber of Siberia's great forests will go south to the treeless plains of Turkestan. Old Turkestan, able to get wheat from the north, will expand her cotton: she can raise enough to supply the needs of the Soviet Union. The cotton planters of America, who now sell tens of millions of dollars' worth yearly to Russia, will feed this railway. The Uzbeks, Tadjiks, Afghans even, will cease to live in mud huts and begin to live in frame houses. Great sawmills are already springing up among the forests of the north; new cotton districts and rice districts will open in the south.

More, this vast area is to become accessible to the outside. Eastern China is to reach west by direct line to Moscow and north by direct line to Siberia. German goods for Chinese Turkestan that once



Bill Shatoff, American Builder of the Turkestan-Siberian Railroad

went from Hamburg by steamer to Shanghai, half round the world, and then past the warring generals to Kalgan, only to start on a dangerous year-long trek of 2,500 kilometers by camel over the Gobi, will now go neatly through Siberia by rail and thence by motor roads to Kashgar.

Villages are already springing up; next year they will be towns. The ancient, mysterious deserts and cases of Chinese Turkestan will be brought in contact with the peoples of the north. The wild tribes of the Asian steppe, untamed since Ghenghis Khan, are competing for jobs on the railway, and taking courses to become ticket collectors and station agents.

For China this railroad is of intense serious import. It means that the north-western provinces, Kansu and Sinkiang, peopled to a very large extent by Moslems having closer bonds with the peoples of Central Asia than with China, will turn to the new regions opened by this railway for their economic development. It will be cheaper and easier to trade across the frontier than to trade in China, particularly as the provinces through which goods have to be moved, Shensi and Honan, have been for a decade war- and bandit-ridden and are economically in a state of despair. Chinese Turkestan can be reached either through Shensi and Honan, through Siberia or through Mongolia. Mongolia is economically and politically already part of the Soviet Union. It would seem that this railroad is designed to make Chinese Turkestan at first

economically and eventually politically a part of the Soviet Union. It is the endless rolling of the snowball in Russia's southward movement.

The political question naturally arises as to whether the concentration of interest in Central Asia will relieve China from Soviet interest in North-eastern Asia. That is, does Soviet Russia plan an economic and political development in Turkestan because Manchuria is more or less closed to Soviet Russia by the position of Japan and the policy of the European Powers, or is China to be faced by Soviet activity in both Turkestan and Manchuria? In China's present weakened condition



it is quite beyond possibility that China can defend herself either in warfare or by economic measures against Russia's peaceful penetration in Turkestan. In Manchuria, China must, to a very large extent, depend upon Japan's claims to South Manchuria to act as a bulwark against Russian aggression, just as, since the Sino-Japanese War, Japan has been keeping Russia out of Manchuria. But Japan cannot always play China's game in Manchuria as long as China is attacking Japan's position there even more aggressively than Russia's position, as long as China impedes Japan's efforts to raise funds by loans in the United States to develop the South Manchuria Railway, and as long as Japan is threatened with an economic boycott because of her position in Manchuria. If Japan continues to be pleased to protect China's sovereignty in Manchuria there can be no fear from Soviet Russia, but suppose one day Japan and Russia come to a regional understanding with regard to Manchuria and Turkestan, then China would be forced to maintain her rights by costly warfare. This, in effect, is the political meaning of the Turkestan-Siberian Railroad, and this is the portend that it holds for China.

Finally, the British interest in affairs in Turkestan cannot be ignored. Sinkiang borders on India and Thibet. Should Russia organize the nomad races of Sinkiang into a union, as Russia did in Mongolia, and establish of them a nation with a capital under a Soviet protectorate, then Great Britain could not but take steps to protect her Indian frontier and her interests in Thibet. This is a problem which at the moment appears far-fetched, but to anyone who has experienced the whirlwind effects of Communist propaganda on the dissatisfied and unhappy peoples of semi-starved areas, such a possibility comes well within the realm of political accomplishments. British policy in China, particularly with regard to the Nanking Government, cannot ignore the existence of this new railroad. It cannot, in particular, permit Soviet Russia to find an easy agency for the transport of arms, munitions, money and food supplies to Kansu, where Feng Yu-hsiang's armies are stationed and through which any country opposed to the Nanking Government can find still easier egress to the Yellow River Valley, through Shensi and Honan, and thence, by supporting oppositional forces to the established Nanking Government, to the Yangtze Valley. Soviet Russia's movement southward by means of the Turkestan-Siberian Railroad may be a less difficult task than *via* Manchuria.

A description of the railway, the country through which it runs, its costs, and the Soviet expectations of it are contained in the following article which is taken from the *Novy-Vostok* :—

The decision to construct a railway line that would connect Turkestan with Siberia was arrived at by the Soviet Union Government on December 3, 1926. The new line begins at the Semipalatinsk station on the Omsk line, and cutting through the town of Semipalatinsk in a south-westerly direction, crosses the Yrtysh River four miles further on; then, passing the town of Alash from the west on the River Yrtysh, turns towards Kokpekty at a distance of 100 kilometres, following the valley of the Tchar-Gurbar River. Hence it heads westward into the valley of the Djarma River. After crossing the Ashtchi-Su River the line ascends the watershed of the basins of the River Yrtysh and the Lake Balkhash, descending thence to the town of Sergiopol. Running along the north-eastern shore of Balkhash it crosses the River Karatal, and, following first the valley of the latter, and then that of the River Bizh, it winds up amid the Maly-Sary chain on the eastern side, touching the Ili settlement, near which it crosses the River Ili. From here the line heads almost straight in a southern direction towards the Alma-Ata station situated on the northern side of the town. From the Alma-Ata station the line, which here is traced northward from the Frunze-Alma-Ata postal track, crosses a number of rivers—viz.: Kaskelen, Tchemolgan, Kargaly and others; through the valley of the River Kopa it crosses the Ala-Tau chain by the Tchokpar Pass. Descending from it in the direction of the River Tchokpar, it crosses the River Tchou not far from the Novo-Troitskoe settlement, whence, following a south-western direction, it approaches the River Kurga-Ta, and running along its valley it reaches the station of Lugovaia, situated at the 424th kilometre of the Arys-Pishpek-Orenbourg branch of the Tashkent Railway.

The entire length of the line is 1,481 kilometres.

The general cost of construction based upon the final estimate sanctioned by the Council of Labour and Defence on May 25, 1928, is 203,700,000 roubles (£20,370,000).

The construction began in 1927, and is at present open to temporary traffic on a length of 157 kilometres on the north from Semipalatinsk, and 131 kilometres on the south from the Lugovaia station.

The economic importance of the Turkestan-Siberian Railway is increasing with the advance of the construction. It is intended to intensify the commercial life of the adjoining provinces and to bring them within the general commercial orbit of the Union from which they had been practically cut off. For example, notices have already been received on the northern end of the line from the institutions for transporting in this season 1,500 wagons of water melons, 75 wagons of hay,

160 wagons of meat, 20 wagons of hide and leather, etc. In the southern section of the line there is a fair quantity of "cakcayr" to be transported from the Kos-Kuduck Villa. The amount of goods to be thus transported could be raised to about 8,000 wagons.

The construction of the line in 1928 as far as Sergiopol immediately increased the Soviet turnover of goods with Western China, while its completion in this year as far as Lake Balkhash raises urgently the question of the utilization of the natural riches of this lake and of the lake itself as a waterway of access of over 500 kilometres. With the completion in this year of the southern section of the line to Alma-Ata a possibility will present itself for the effective exploitation of this richest region of the Djetysovsk Province (formerly Semirechinsk Province).

In estimating the importance of the Turkestan-Siberian Railway, not only its centre of gravity needs to be considered, but also the extent of its economic influence.

Considered from this point of view, its sphere of economic influence extends over: (1) Western Siberia, comprising the districts of Slavgorod, Barnaul, Biisk, and Roobtsov; (2) the Kasatsk A.S.S.R., with the governments (provinces) of Semipalatinsk and Djetysovsk and the Aulieatinsk and Tchimkent districts of the Syr-Daria government; (3) the northern part of the Kirgiz A.S.S.R. The length of the line will at the same time be much shorter: 2,713 kilometres from Tashkent to Novo-Sibirsk instead of the existing circular route of 4,618 kilometres.

The population of the territory which is under its sphere of influence is 5,540,700, while the territory itself measures 124,374,345 "ga" (=1A?), of which 16,587,185 "ga" is arable land (13.3 per cent.), 57,277,254 "ga" excellent for pasture (46 per cent.), and 10,599,308 "ga" is covered with good forest (8.6 per cent.).

The completion of the Turkestan-Siberian Railway will, no doubt, intensify the exploitation of the natural riches of the region, the commercial possibilities of which are very vast.

The industries of Kazakhstan and Kirgizia are of four kinds—viz.: (1) agricultural, cattle breeding (where both are of equal importance, with agriculture slightly predominant); (2) cattle breeding (agriculture with cattle breeding predominating); (3) cattle breeding where agriculture is either not followed at all or is of insignificant character; and (4) purely agricultural.

The general arable area of the whole region is 4,415,419 "ga," of which Western Siberia includes 2,867,153 "ga" (65 per cent.), the Semipalatinsk government 776,003 "ga" (17.6 per cent.), Djetysovsk government 338,200 "ga" (7.6 per cent.), and the Tchimkent and Aulieatinsk districts of the Syr-Daria government 195,893 "ga" (4.4 per cent.); while the whole of Kazakhstan includes 1,310,096 "ga" (29.6 per cent.), and the Northern Kirgizia 238,170 "ga" (5.4 per cent.).

The cattle in the whole region number 28,883,480 head, being thus distributed:

Western Siberia	..	..	6,541,200 (22.6 per cent.)
Semipalatinsk Government	..	..	8,282,200 (28.7 " ")
Djetysovsk	..	..	5,121,900 (17.7 " ")
Tchimkent District	..	..	1,628,600 (5.7 " ")
Aulieatinsk	..	..	3,123,400 (10.9 " ")
Kazakhstan	..	..	18,155,900 (63.0 " ")
North Kirgizia	..	..	4,186,380 (14.4 " ")

At present only produce of Western Siberia, Semipalatinsk government, and partly of the above-mentioned districts of the Syr-Daria government, need to be seriously considered for the trade balance of the Union.

The general produce of both the agriculture and cattle-breeding areas by the time the construction of the line is absolutely completed may be represented as follows:

	Grain: 1,000,000 Puds.	Big Cattle: Head.	Small Cattle: Head.	Butter: Puds.	Wool, Hides, Casings: Puds.	Fruit: Puds.
Western Siberia	.. 46	200,000	300,000	1,000,000	150,000	—
Semipalatinsk Government	.. 18	200,000	600,000	200,000	100,000	—
Djetysovsk Government	.. 8	100,000	500,000	150,000	100,000	500,000
North Kirgizia	.. 4	50,000	500,000	80,000	50,000	50,000
Total	.. 76	550,000	1,900,000	1,730,000	700,000	550,000

By the end of the first five years the import of flour into Central Asia, it is estimated, will amount to 60,000,000 puds, as against 26,500,000 puds in 1927.

At the present time flour is imported into Central Asia from Siberia to the extent of 40 per cent., from Northern Caucasasia 33 per cent., from the Ukraine 17 per cent., and from the region of the Tashkent Railway 10 per cent. After the completion of the Turkestan-Siberian Railway the North Caucasian and Ukrainian flour could be diverted for export, and the Siberian flour to Central Asia. The direct transportation of flour from Siberia to Central Asia over the new line will, it is calculated, decrease the transport expense by 20 kopeks per pud. The saving thus effected from the transport tariff alone would amount to 12,000,000 roubles, and that without taking into account the consequent increase in the Soviet foreign trade.

For the national organization of flour trade the construction of twelve elevators and seven mills is planned in Western Siberia. The elevators will be erected one at each of the following centres: Semipalatinsk, Sergiopol, Taldy-Koorgan, Alma-Ata, and Frunze.

The meat trade equally needs to be reorganized. Refrigerators are to be erected in Kazakhstan, at Semipalatinsk, Sergiopol, Alma-Ata;

in Kirgizia, at Frunze or at Tokmak; while in Western Siberia the number of the existing ones after their thorough repair is to be considerably increased.

The existing hide industry in the neighbourhood of the line includes the works at Barnaul, Biisk, Semipalatinsk, Alma-Ata, Taldy-Koorgan and Tchilik. There are in Kirgizia about fifty tanneries. Additional tanneries are to be constructed at Semipalatinsk, with a yearly output of 100,000 large hides; and another at Frunze, where over 170,000 large hides will be treated yearly.

The butter industry is extensively developed in Western Siberia and in the Semipalatinsk government, where there are a number of big factories. New butter factories are to be built at Malovodny, in the Djetysovsk government; at Frunze and Karakol; at Slavgorod and Roobtsov.

Other industries which exist in this region and need extensive reorganization and intensification of their output are the forest and mining industries, the cement and chemical industries, the fishing industry and the sugar industry, all of which are of especial importance in the region. Meat and fruit canning also have a promising future.

The cement industry requires immediate attention.

The region is at present supplied with this commodity by works situated at a great distance, and the freight charges are unavoidably and unbearably high. The extension of the local cement industry would be therefore of great expediency. The existing cement works at Tchouisk, the output of which is about 100,000 puds per annum, is not certain of its supplies of raw material, nor is it at an economic distance from the railway (20 kilometres); its extension would be an unwise policy.

With the completion of the Turkestan-Siberian Railway the mining industry should receive much assistance, especially on the north-western shores of the Balkhash Lake. The establishment of steamship lines on that sheet of water will facilitate this exploitation. Goolshadsk and Kzyl-Espe are rich in tin, lead, and silver. The supply of cheap coal will also be facilitated. The temporary traffic on the Turkestan-Siberian Railway enables even at present the extension of the Akdjalsk gold mines. The construction in Siberia of Tebelsk metallurgical works, with an output of 660,000 tons per annum, would fully safeguard the supply of iron. The coal deposits in that region of the line would contribute considerably to the extensive development of the mining industry. Of the coal deposits the largest are the Ekibas-Tooisk, with a reserve of about 60 million tons; the Karagadinsk, with 300 million tons; the Kooldjinsk, with about 160 million tons, and a few more. At present the coal mines are worked only in the Kooznetzk region.

The timber industry of the region is closely connected with the real object of the line, which is to supply cheap timber for building purposes in Central Asia, which in its turn is connected with the more normal development of the cotton industry. The new line will cheapen the cost of timber freight by 40 per cent.

With the approach of the line to Lake Balkhash the fishing industry acquires a much greater importance, especially so as the fishing on the River Yrtys and on the Lakes of Zaisan, Ala-Kul, and Tsyk-Kul is only of local importance. With the proper organization of fishing on the Balkhash a considerable quantity could be exported annually. Professor Berg has been dispatched to the region to study and report upon the possibilities of the fishing industry there.

The problem of electrification of the region for the purposes of the development of local industries has not yet been fully considered. So far only the construction of one hydro-electric station has been decided upon—namely, at Ubinsk, with a power of 70,000 kilowatts. This station will, it is calculated, be able to supply a considerable industrial area of the region with power, including even Semipalatinsk, at the cost of 1.5-4 kopeks per kilowatt, which would make it possible to enlarge the plan of industrialization, especially in the sphere of the chemical and mining industries. The power resources of the region are insufficiently estimated at over 1,200,000 horsepower.

The completion of the Turkestan-Siberian Railway will confront the Soviet authorities with the necessity of further extension of transport facilities, and with this end in view the construction of railways of access is being considered—namely: Kooloonda-Semipalatinsk; Ridder-Roobtsovka; Atbassar-Semipalatinsk or Sergiopol; Sergiopol-Tchoogootchak; Alma-Ata-Kouldja; Frunze-Tokmak-Rybatchie, and others. Of these, of immediate necessity are Kooloonda-Semipalatinsk and Frunze-Tokmak branches.

The water transport needs to be improved on the River Yrtys between Zaisan-Semipalatinsk, on the River Ili, and the Lake Balkhash.

The completion of the line in 1929 to the River Ili will open a cheaper route to Kooldjia Province, while the construction of the Frunze-Tokmak branch, and the improvement of the Tokmak-Naryn-Toorogart-Kashgar (500 kilometres) road will facilitate the trade with the Kashgar Province.

Simultaneously serious attention would have to be paid to the trading routes to Western China, as the contemplated completion of the line between Semipalatinsk and Sergiopol and the improvement of the Sergiopol and Tchoogootchak section (200 kilometres) should have the effect of automatically normalizing and increasing trade with Western China.

Book Notes

The Government of China

THE CHINESE REVOLUTION, by Arthur N. Holcombe, Cambridge, Massachusetts, Harvard University Press, 1930

When Professor Arthur N. Holcombe of Harvard University was in China, he was in search of a government and a system of Government. For that is his especial business in life, analyzing

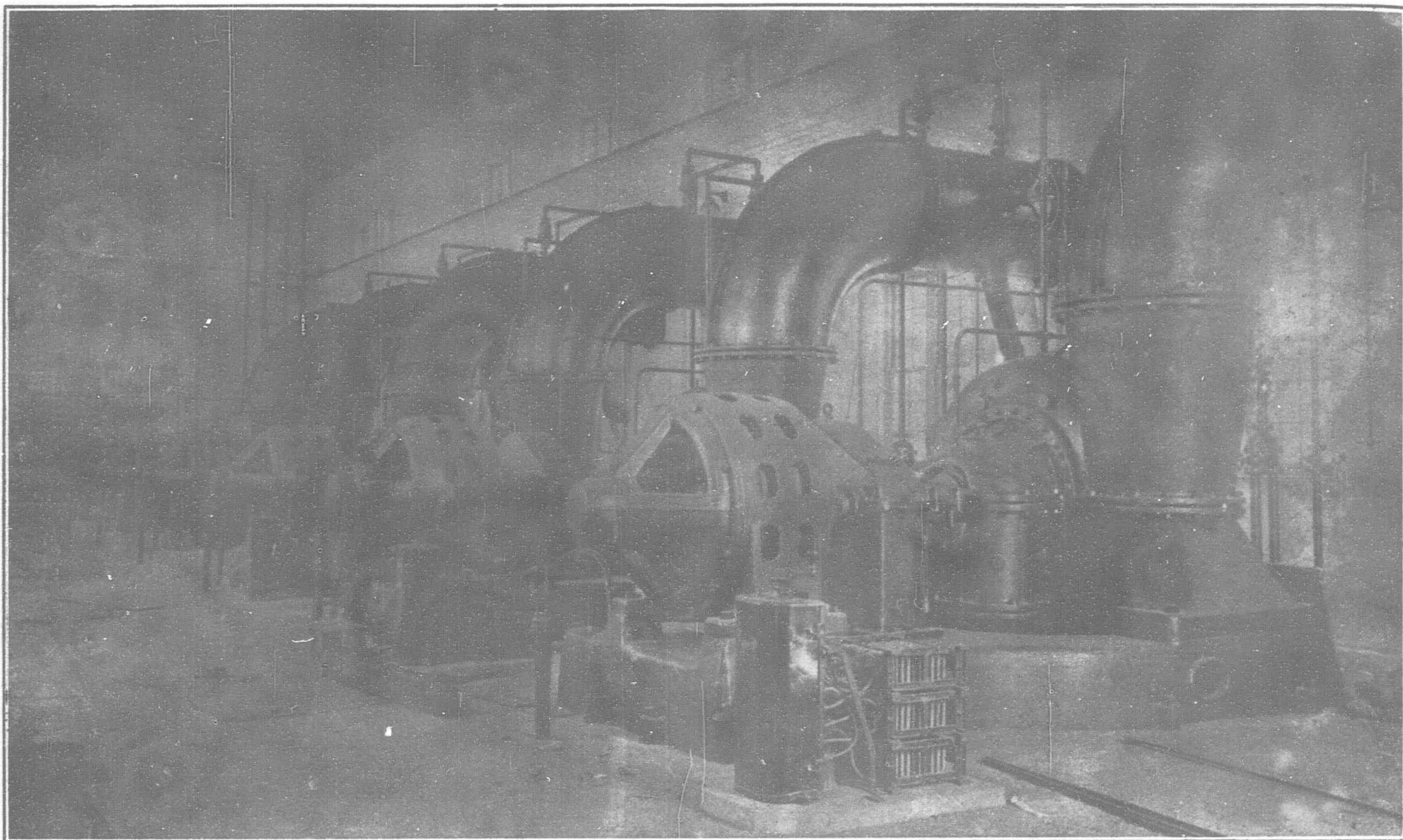
governmental processes. He came to China *via* Suez and Singapore, and left it *via* Russia. He was here during the December Communist rebellion in Canton and saw the capture of Peking by the Kuomintang seven or eight months later. In a word, he was in China during the formative period of the Nanking Government, which is a political institution, marks the rise to power of the Kuomintang unassisted by Communism and Soviet Russia in contrast to the Canton and Hankow Governments which were a union between the Kuomintang and the Communist Party. The divorce marks a permanent difference not only in ideology, but in methods of procedure in international relationships and in domestic policy. Foreigners often suggest that all this talk about ideology is mere persiflage; that only a tiny fraction of the whole people are affected by principles; that the vast masses of the Chinese people hardly know what it is all about. This view does not at all take into consideration the intensive and effective propaganda of 1924 to 1927, which covered every province of the south and affected every village in those provinces. This view does not take into consideration the fact that this propaganda "took" most potently not in the industrial and western-affected cities of Canton and Shanghai, but in the interior of such provinces as Hunan, Hupeh, Kiangsi and Kuangsi. When Professor Holcombe was here, the most vital propaganda effort had ceased, but he was keenly sensitive to its force, and his task was to find what it was all about.

The result of his study, not only in China but at the Research Department of Sun Yat-sen University in Moscow as well, is the ablest and most complete presentation of Kuomintang ideology, principles, policy, and method that has yet appeared. He answers the question as to what it is all about just as Bryce answered it for the United States and Lowell for England. That is, the professor of governmental studies recognizes China as an experimental laboratory, used scientific methods of approach, and produced an impartial, studious analysis which will stand as long as the Kuomintang is important and which will afterwards be used as the reference book for the historical student.

The structure of Professor Holcombe's thesis is splendid. He states the problem of China, which is divided into three questions: The Disintegration of China, the Nationalist Movement, and the Question of Chinese Political Capacity. He then deals with the central idea of the book, and Professor Holcombe's assumption as to what is the central idea of China's particular political and social genius, namely, the Scholastic Empire. The next two chapters are historical résumés, which bridge over the gap between disintegration and the efforts of the Kuomintang, which are represented by The Revolutionary Politics of Sun Yat-sen. These politics, when affected by a union with the Communist Party of China and when supported by Soviet Russia, produce the Chinese Soviet Republic, which in turn is destroyed by the Triumph of the New Militarism. So much is historical. The next chapters are ideological, and from the standpoint of the student of history and politics represent the essence of the volume, namely, the idea of the Dictatorship of the Kuomintang, the Period of Political Tutelage, and the Outlook for the Five Power Constitution. The appendices, starting with the Will and ending with the Manifesto of the Second Plenary Session of the C.E.C., chronologically document the case for the Kuomintang.

Now, whereas propagandists for the Kuomintang have been laboring for years to produce a mountain and have simply developed a swamp, Professor Holcombe has provided exactly what the student wants: a reply to the question, What is it all about? There is no propaganda, no belaboring of any particular point, no explaining away imperfection. There is as scientific a study of what the Kuomintang mean when they refer to themselves and the Government of China as a biologist would produce if he were describing a mammal. There are occasionally errors in fact and there are a few unfortunate errors in translation, but even in this respect the errors are remarkably rare, considering the immense amount of material dealt with and the conflicting sources of information, Nanking, foreign, Left Wing, Communist, Russian. There are too few foot-notes, so that when Professor Holcombe states a fact which strikes one as dubious, it is not possible to check his source of information. He tends to appraise General Chiang Kai-shek too unfavorably, but this is a matter of personal opinion. His estimate of Yen Hsi-shan is too laudatory and is based upon studies of the Shansi general's growth up to 1927 and does not take into consideration his subsequent shift to Napoleonic concepts of state. In his historical references, Professor Holcombe

(Continued on page 158).



Tamachi Pumping Station

Reconstruction of Tokyo

1.—The New Sewerage Works

By Zenro Hara, Chief Engineer, Department of Public Works, and Chief, Bureau of Sewage Works, The City of Tokyo

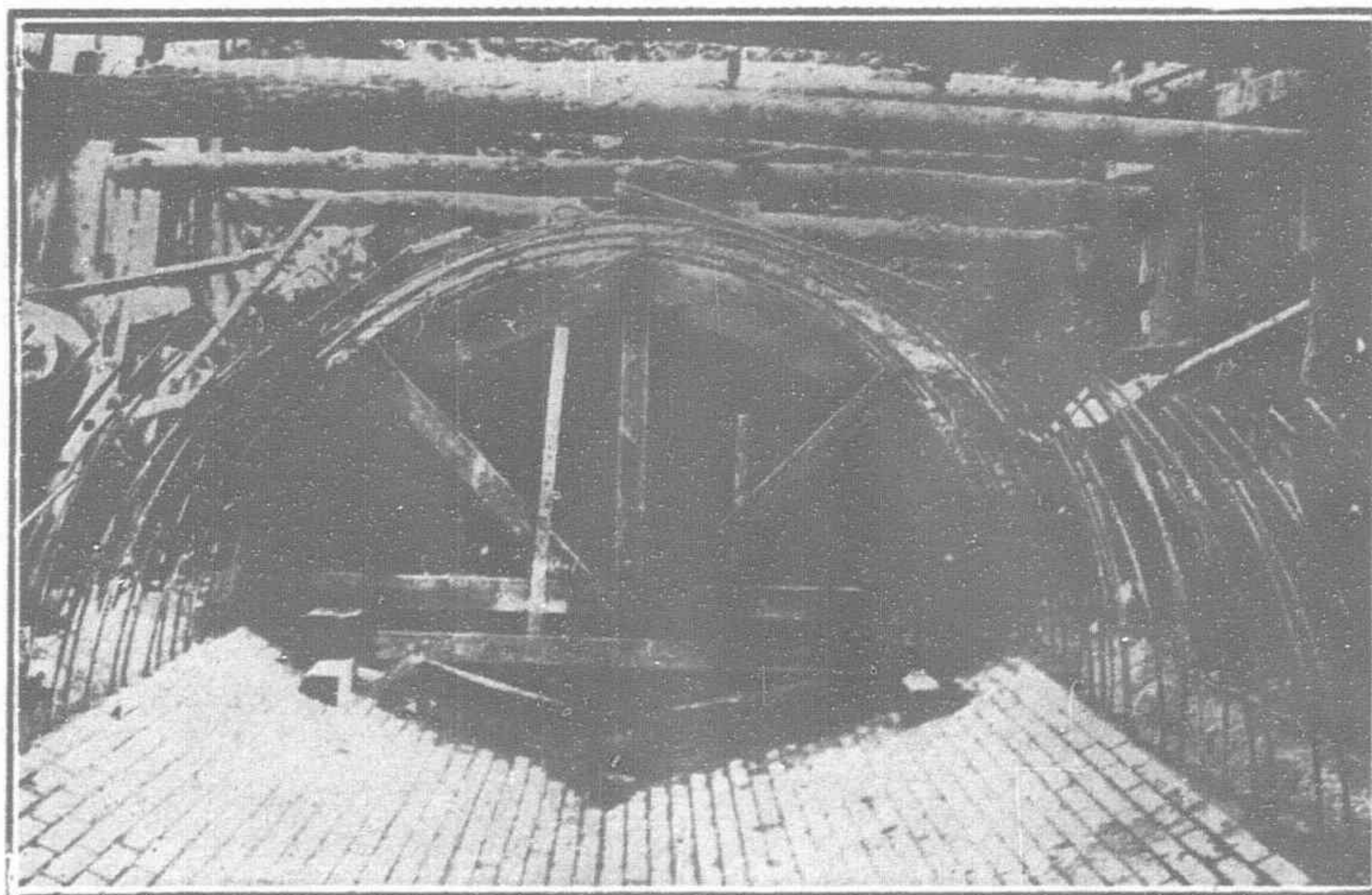
FROM the time of its foundation centuries ago the city had open street drains by which the surface and waste waters were discharged into moats, navigable canals, and rivers. However, with the development of the city and its increase of population these drains developed without system, so that by their means sanitation and general hygiene became extremely difficult. After a conflagration which wiped out the business section along the Ginza in 1871 the construction of modern building began, and with the appearance of European structures came a demand for further western street facilities. In 1876 the necessity of the modern sanitary method received further recognition by the Government and the people from a violent outbreak of cholera which caused widespread consternation among the citizens; and the outcry for a general water and sewerage system for the city was insistent. Between 1883 to 1885 Tokyo-Fu, the Local Authority laid some sewers of the separate system, with the subsidy of the Government, in the streets of Kanda, a ward of Tokyo.

In August 1888, the Street Improvement Committee of

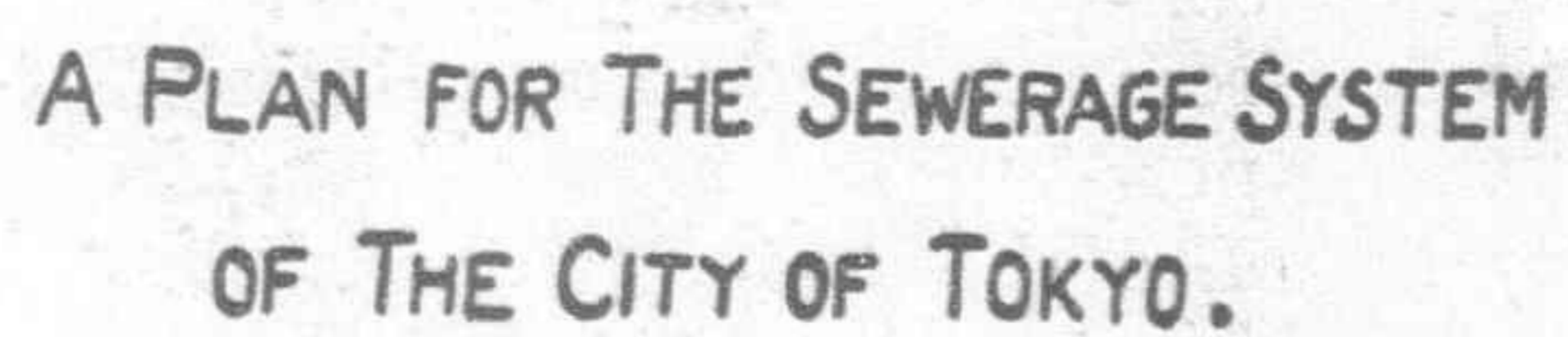
Tokyo was organized and the committee established a sub-committee to investigate water and sewerage. In the next year a report of a sewerage scheme on a separate system was presented but could not be acted on because it was thought that the water works should be settled before plans were adopted for sewerage.

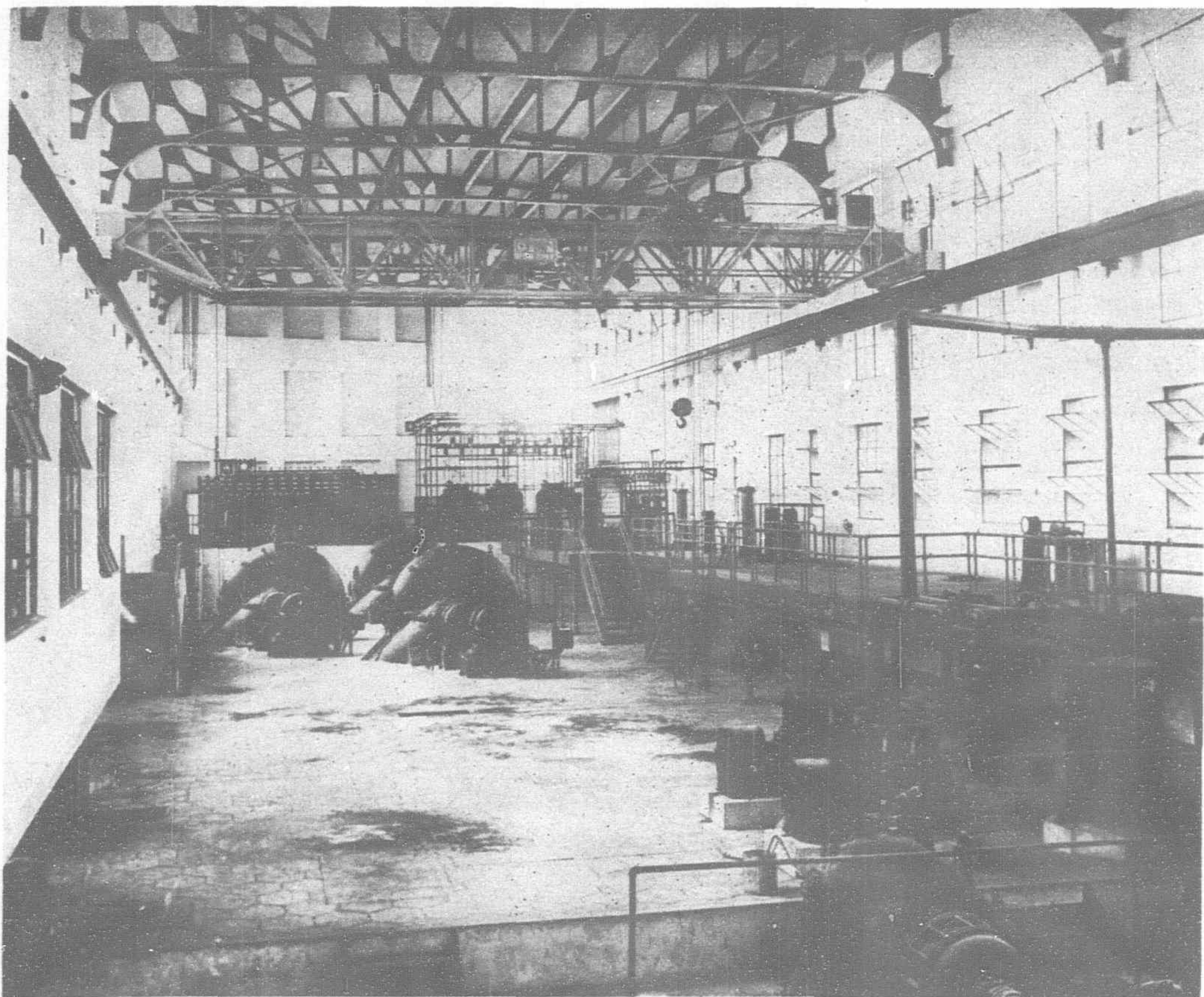
After the construction of the water works ended in 1898, five years running from 1899 to 1904 were devoted to a thorough survey of the conditions and needs of city, in order to mature the sewerage plan; and a complete report was presented to the Imperial Government and received approval, after which the Municipality authorized its plans in April 1908. Thus the fundamental scheme for the improvement of the sewerage system was established.

In June 1911 the City Assembly voted to lay out the amount of Y.6,130,000 in beginning the work for the first undertaking from 1911 to 1918, in the Drainage District No. 2, for which both the Minister of Home Affairs and the Minister of Finance gave their approval and the Government agreed to defray one-third of the estimated outlay. An office was opened and the work began. Owing to the great rise of commodity



Reinforced Concrete Sewer, Horse Shoe Section





Narihirabashi Pumping Station, Equipped with Ebara Centrifugal Pumps: Hitachi 5 Ton Travelling Crane

prices and wages as a consequence of the great European War of 1914, the estimated cost and the term of the first undertaking were forced to be changed from time to time, until they were finally settled on Y.15,000,000, and twelve years of undertaking from 1911 to 1922. Thus the sewerage of the City of Tokyo dawned with the opening of Mikawashima Disposal Works in March 1921 and the completion of the sewerage system in the District No. 2 in the next year.

Meanwhile, the city started another works in 1914 at a cost of Y.2,500,000 for eight places in the District No. 1, where flood often visited and caused great damages, and completed the same in 1920.

By this time, the development of the city and its environs was quite rapid and the works of the street improvement showed so much progress as there arised the necessity of re-investigation with the sewerage scheme established in 1908. After a thorough investigation of two years the future scheme was rectified with the opinions of the authorities of the Committee of the Sewerage held in 1921 and 1922, under the approval of the Government Board of the Special City Planning for the Capital.

As the second undertaking, the works for the Low-level District of the Drainage District No. 1, which covers the civic center of Tokyo were commenced at a cost of Y.20,000,000 as a continuous undertaking for eight years from 1920 to 1927. On the course of progress, a severe earthquake, all of a sudden has befallen upon Tokyo and its vicinity at 11:58 in the morning of September 1, 1923 and suspended all

the works for a while leaving enormous damages upon the works.

Fortunately, however, they have re-opened since November of the same year as one of the Reconstruction Works of Tokyo with some Y.43,500,000 expenses, adding the works of the other burnt places in the Drainage District No. 1 together with the main sewers, pumping stations and the disposal works in the Drainage District No. 3. They are now showing great progress and are expected to be completed by the end of this fiscal year.

In the same time, for the purpose of prevention of flooding in the District No. 1, the city laid twenty mains during five years from 1924 to 1928, at a cost of Y.4,580,000.

In short, the city completed so far about fifty per cent. or more of the sewerage scheme within eighteen years from 1911 to 1929 with the total expenditure of about Y.70,000,000.

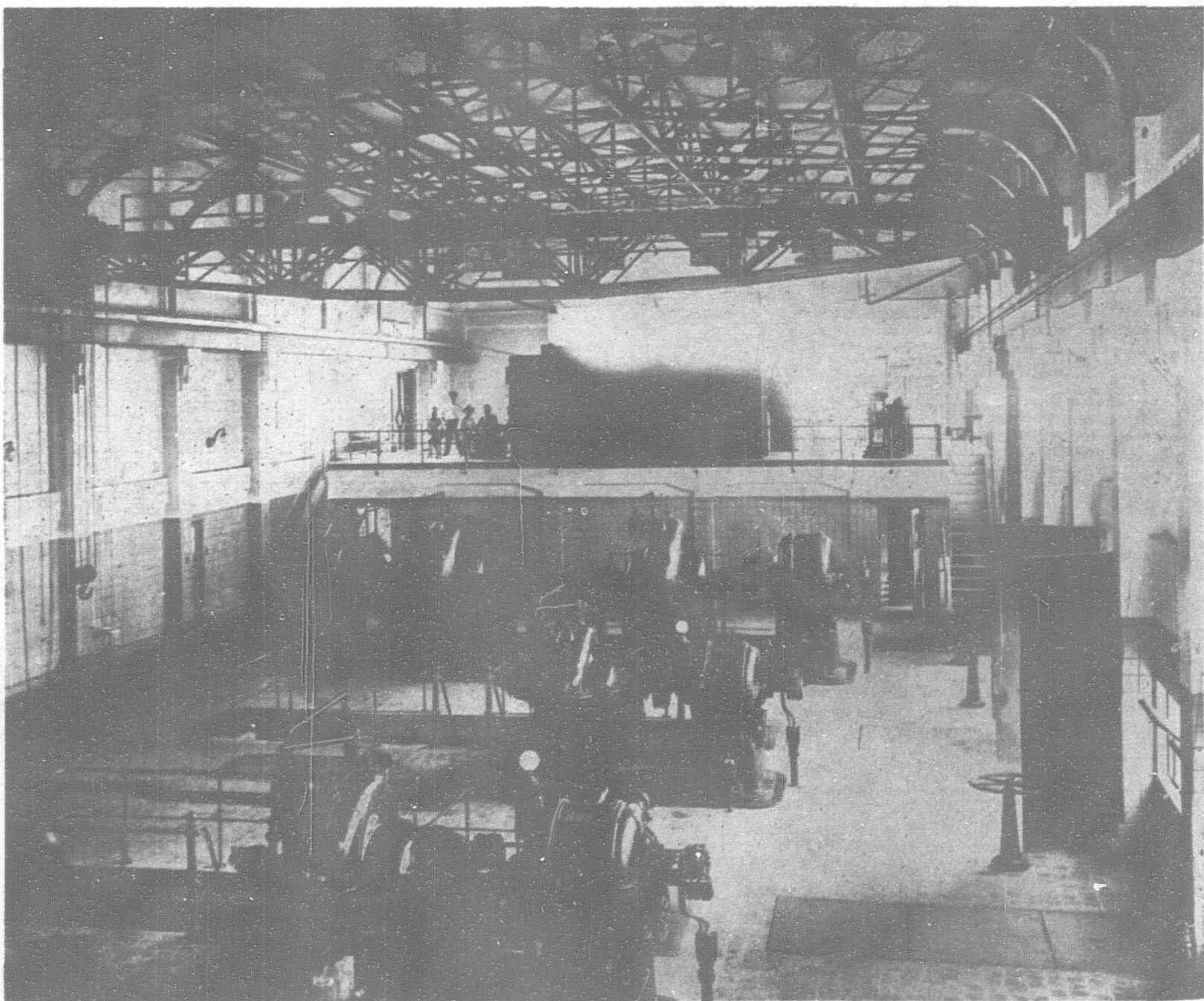
As a final undertaking to complete the entire sewerage of Tokyo, the works of the remaining parts of the District No. 1 and others including Haneda Disposal Works with a total cost of Y.65,000,000 for ten years from 1930 to 1939, inclusive now are proposed for the immediate consideration.

The Outline of the Plan

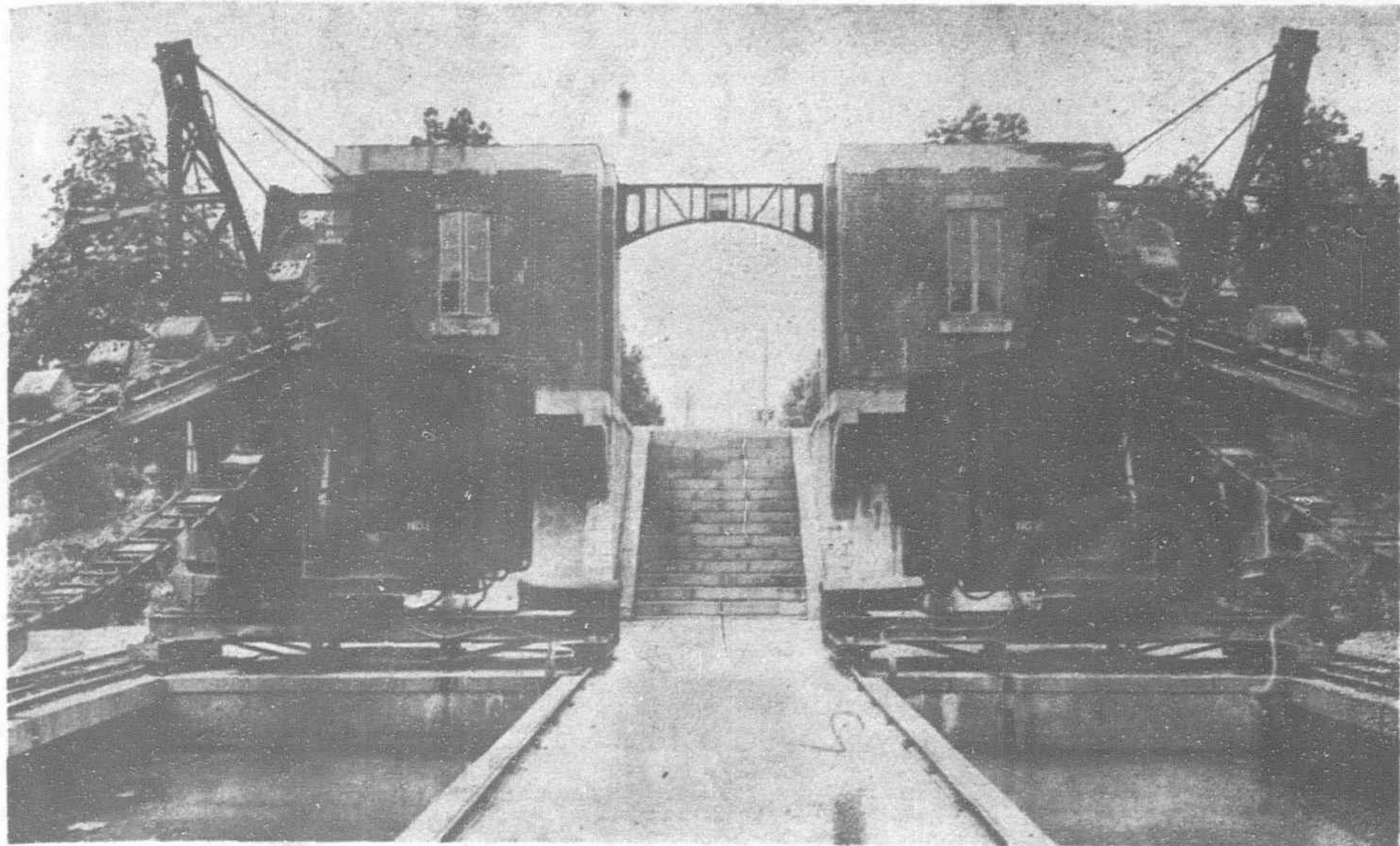
The total drainage area of the City of Tokyo including some parts of sub-

urbs is about 8,230 hectares with a future population estimated at 3,440,000.

The system of sewers is chiefly a combined system conveying rain and foul waters through the same pipes except the special



Zenigamecho Pumping Station: Equipped with Hitachi Motor Driven Centrifugal Pumps and Travelling Crane



Grit Chamber, Mikawashima Sewage Disposal Works

cases that the topographic conditions necessitate the separate sewers. The maximum quantity of sewage to be drained is estimated on the assumption that a half of six cubic feet of the foul water, which is the average amount per person per day, is to be discharged within eight hours, while the maximum rate for rain water is set at 50 millimeters per hour. There are used vetrified earthenware pipes for the sewers less than 45 centimeters in diameter, precast reinforced concrete pipes for ones up to 136 centimeters in diameter and fieldcast reinforced concrete shapes for greater ones.

The drainage district of the city is divided into three large divisions from its topographic features, namely District Nos. 1, 2 and 3.

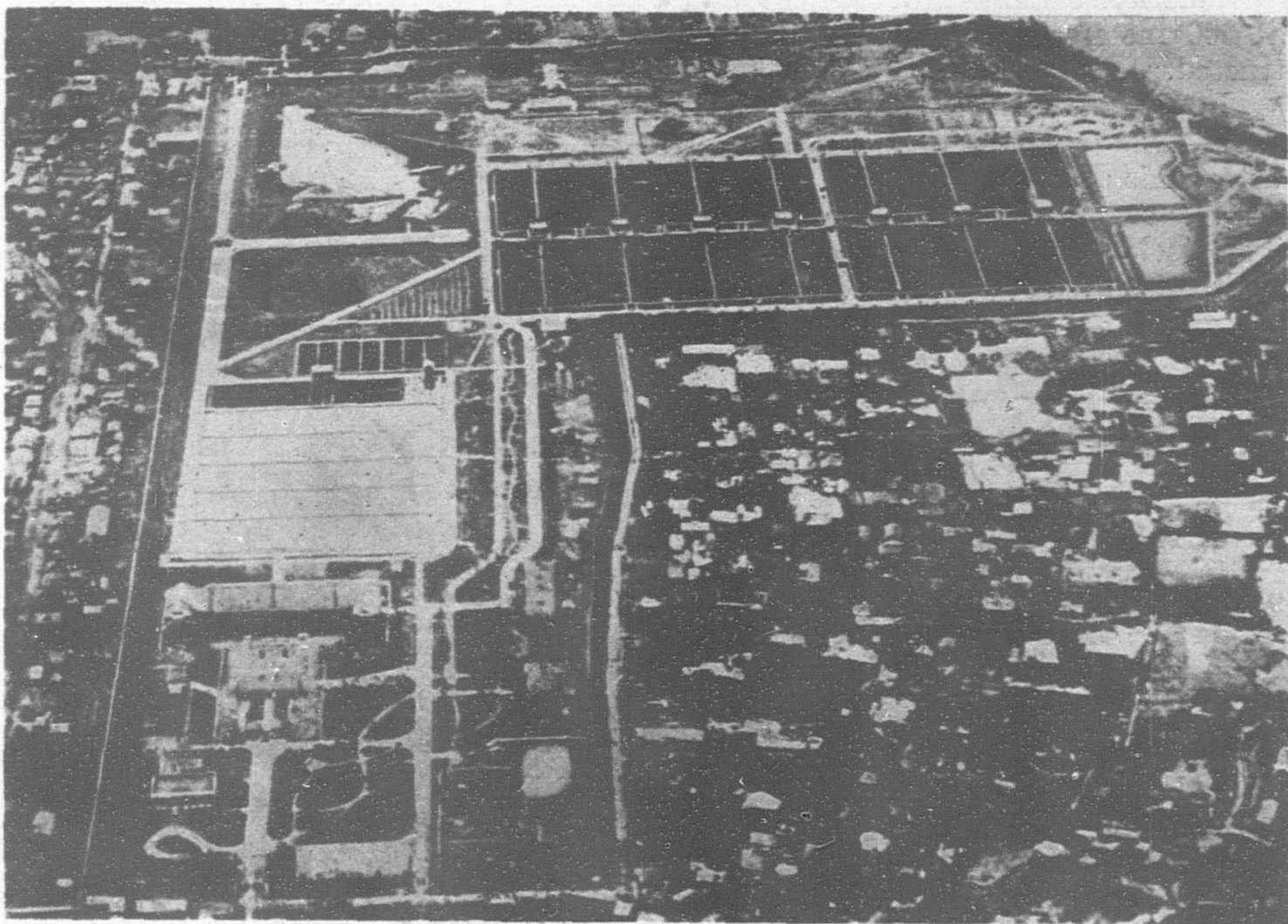
The whole volume of sewage with a portion of surface water from each district is carried by the main intercepting sewer to the respective disposal works; Haneda for District No. 1; Mikawashima for District No. 2; Sunamachi for District No. 3; and is discharged into sea or river after treatment. The excess rain water gathered to the combined sewers is discharged directly by the relief outlet or by means of pumps into the nearest river or canal.

estimated at 1,800,000. To facilitate drainage operations the district is subdivided into three sections, designated as High-level, Middle-level, and Low-level District according to the geographical conditions.

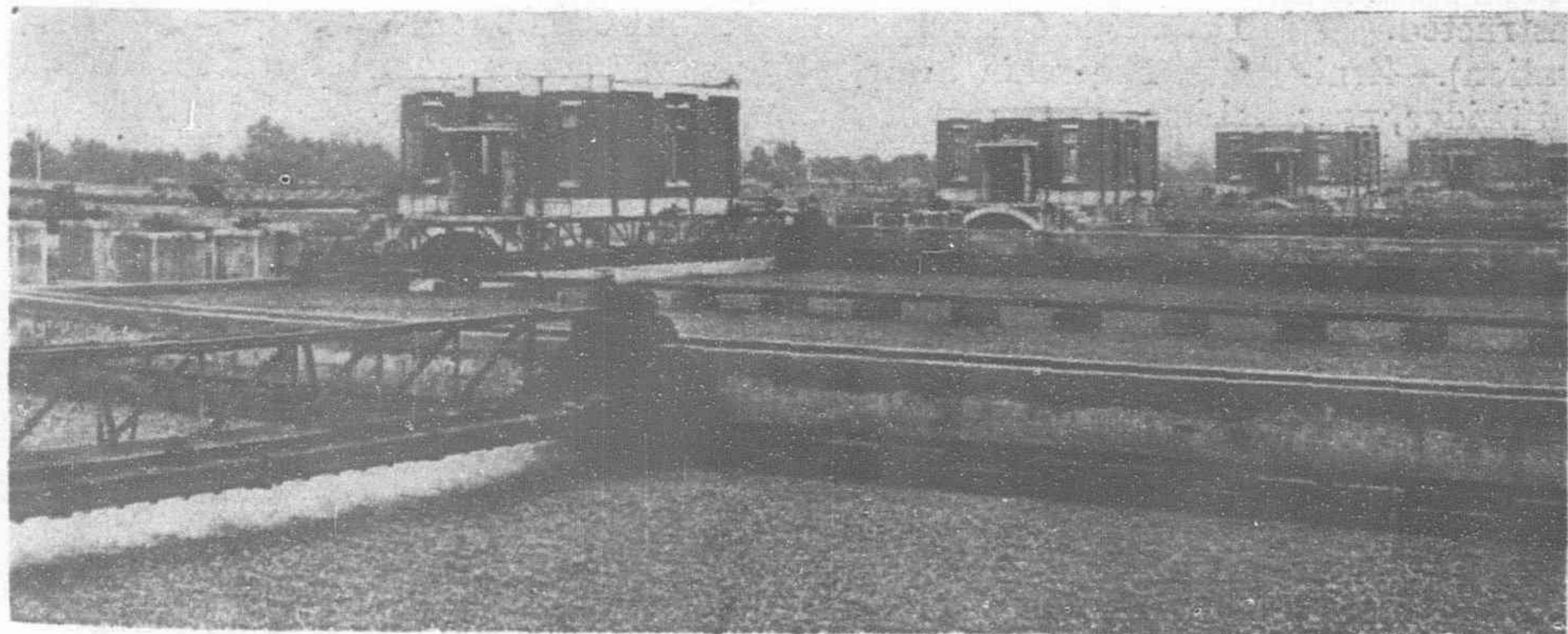
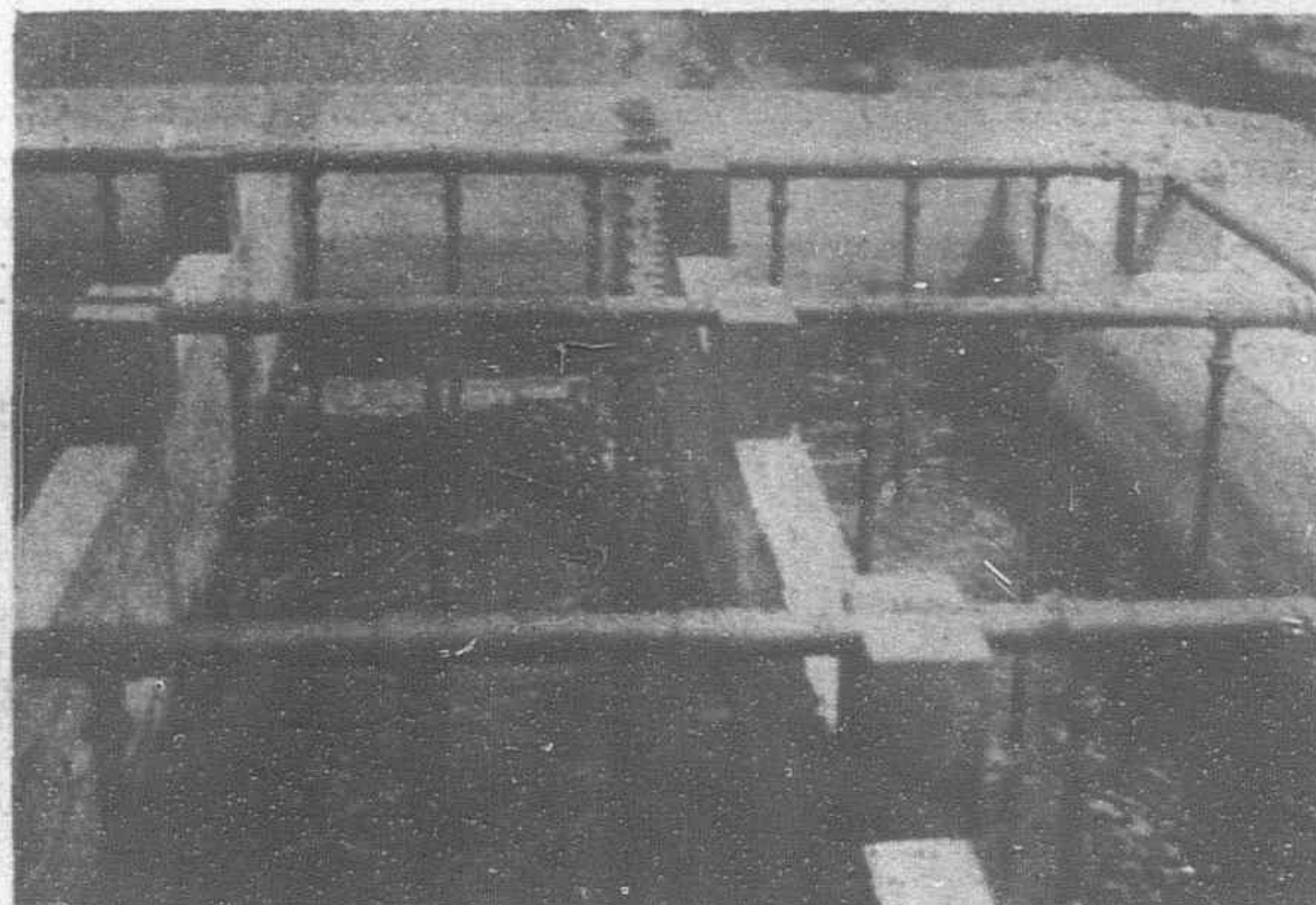
HIGH-LEVEL DISTRICT.—The district includes the wards of Azabu, Akasaka, and some of Kojimachi, Shiba and Yotsuya. The sewage of this district may be let flow by gravity to the final disposal works at Haneda. The main sewer comes down above to the main of the Middle-level District at Fudano-tsuji, there forming two-story conduit reaches Shibaura and combines with the delivery main of Shibaura Pumping Station which is the trunk sewer of the District No. 1 from Shibaura to Haneda.

Total drainage area of this district is about 1,693 hectares with a population estimated at 400,000 and total length of sewers is nearly 229,000 meters of which about 36,000 meters were constructed.

MIDDLE-LEVEL DISTRICT.—The district includes the greater part of Hongo and



Mikawashima Sewage Disposal Works

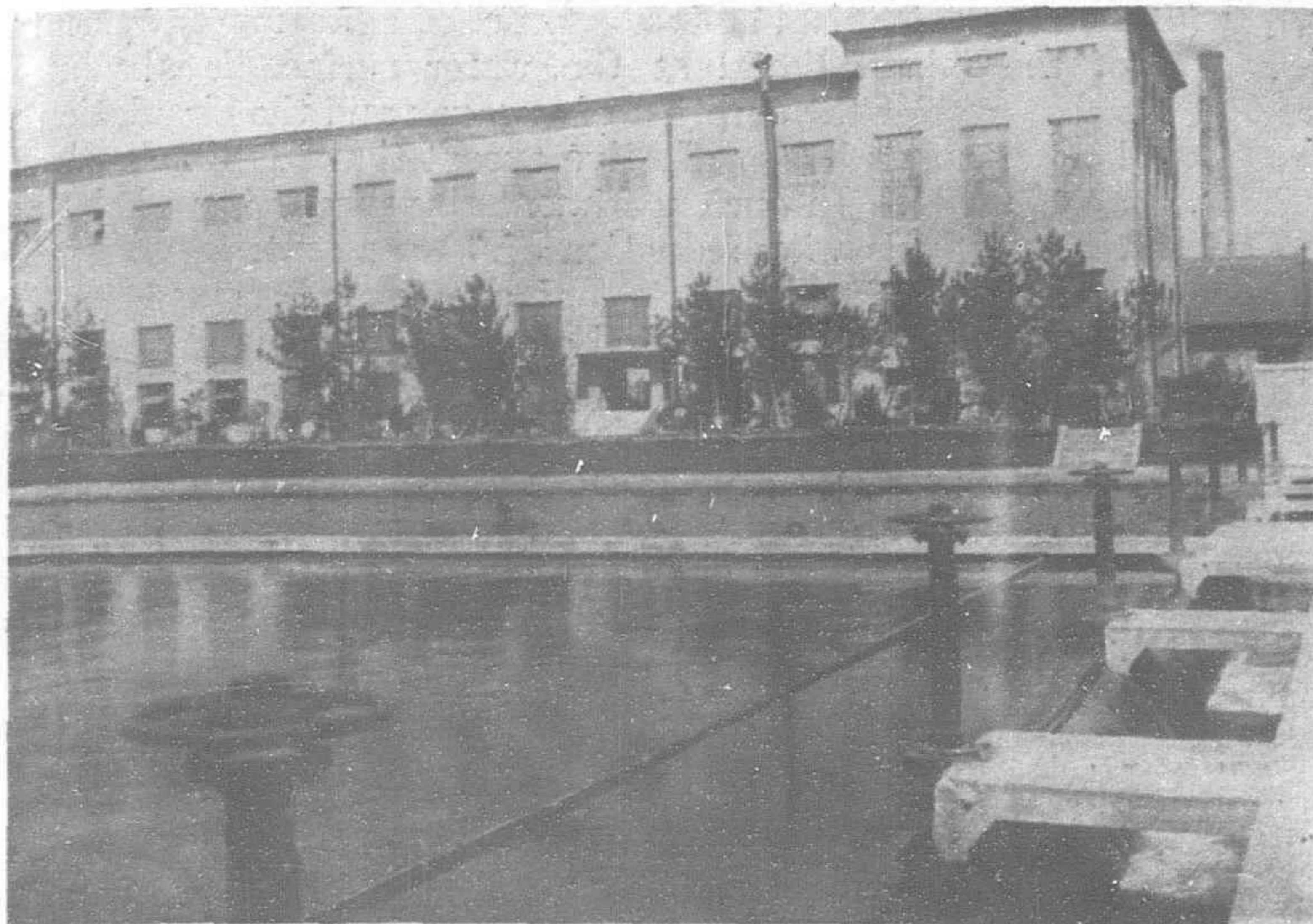
Mikawashima Sewage Disposal Works
The Trickling Filter

Aeration Tanks

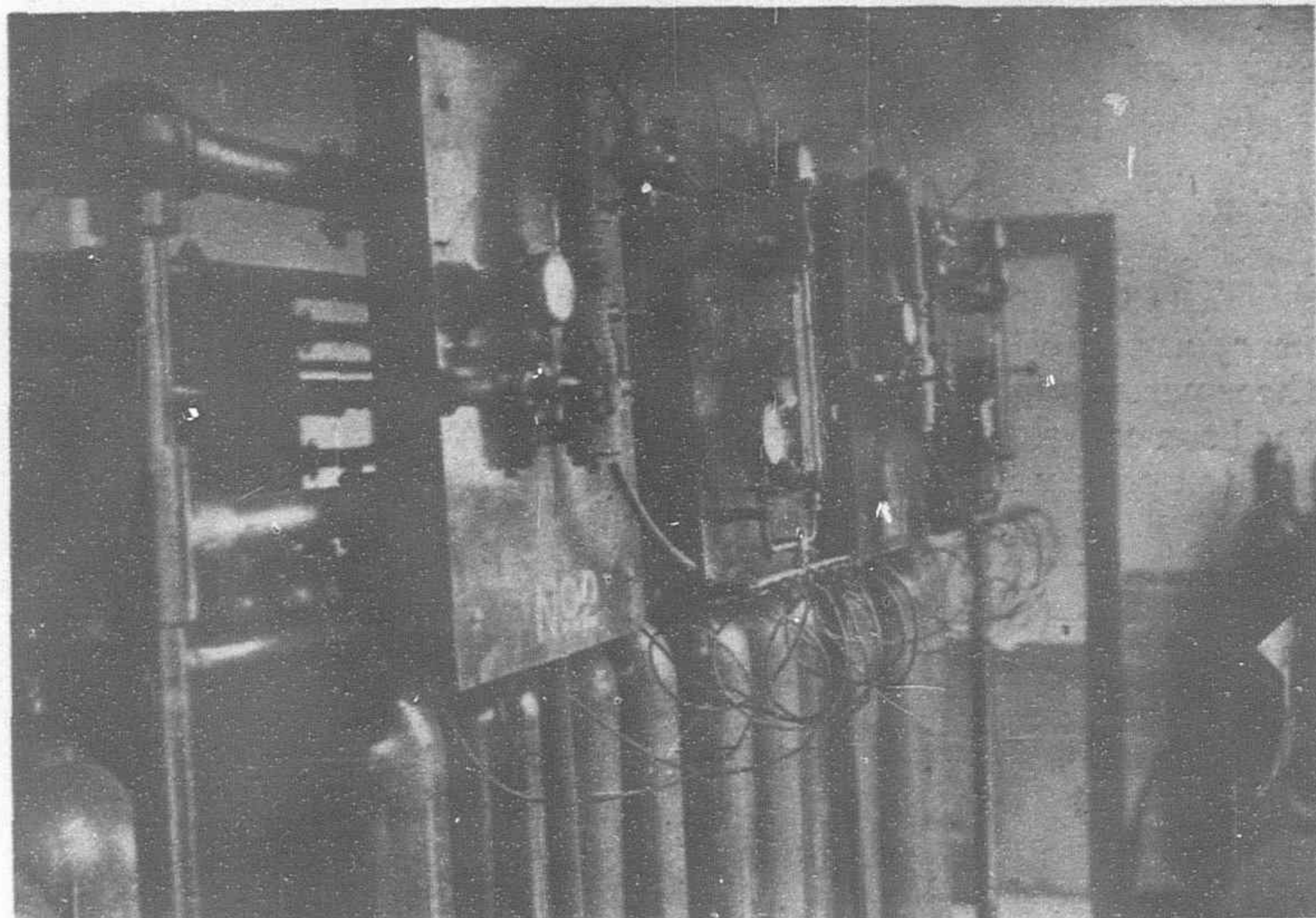
Drainage District No. 1

The District No. 1 includes the wards of Shiba, Azabu, Akasaka, Kojimachi, Yotsuya, Ushigome, Koishikawa, Hongo, Nihonbashi and Kyobashi, the greater part of Kanda and some of Shitaya; and covers a total area of about 6,154 hectares with a population

some of Kojimachi, Ushigome, Yotsuya, Koishikawa, Kanda, Shitaya and Shiba. The main sewer of this district after received the sewage of the Low-level District at Otemachi, runs down southward and reaches Shibaura. As the sewage of this district as well as that of the Low-level District are impossible to drain by gravity to the final disposal works, the Shibaura Pumping



Shibaura Pumping Station: Pump House in Rear



Tsomura Gomei Chlorination Apparatus, Installed at the Shibaura and Sunemachi Pumping Stations

IZUMICHO PUMPING STATION (under operation).—Izumicho Pumping Station is equipped with three small sewage pumps of a total capacity of 18 cubic feet per second. The function of the establishment is to lift up the sewage of the remotest part of the district into the main sewer.

Total length of sewers in the District No. 2 is about 277,000 meters of which 235,000 meters have been constructed already.

Drainage District No. 3

The Drainage District No. 3 covers the wards of Honjo, Fukagawa and Tsukishima of Kyobashi ward, east of the river Sumida, and being the lowest district of the city, neither rain nor foul water can be discharged except in the time of low tide.

Three large pumping stations, Narihirabashi, Sannohashi and Kiba are provided for the drainage of surface water as well as foul water. In case of heavy rain fall and high water level of canals, all the surface and waste waters collected at the pumping stations are discharged into the canals by lifting them by means of the storm water pumps. The foul water together with some of rain water are pumped up into the main sewers connecting each pumping station, by the sewage pumps and are carried away until they reach to the final disposal plant at Sunamachi.

A small pumping station is to be installed at Tsukishima to force up the local sewage to the main sewer at Fukagawa.

Total area of this district is about 1,252 hectares with an estimated population of 670,000, and total length of sewers is 339,000 meters of which about 97,000 meters including all main sewers are under construction.

NARIHIRABASHI PUMPING STATION (under operation).—Narihirabashi Pumping Station is situated at the north part of the district and is to be installed with six large storm water pumps of a total capacity of 560 cubic feet per second and four sewage pumps of a total capacity of 44 cubic feet per second, of which three of the former and three of the latter are equipped and working at present.

SANNOHASHI PUMPING STATION (under operation).—Sannohashi Pumping Station

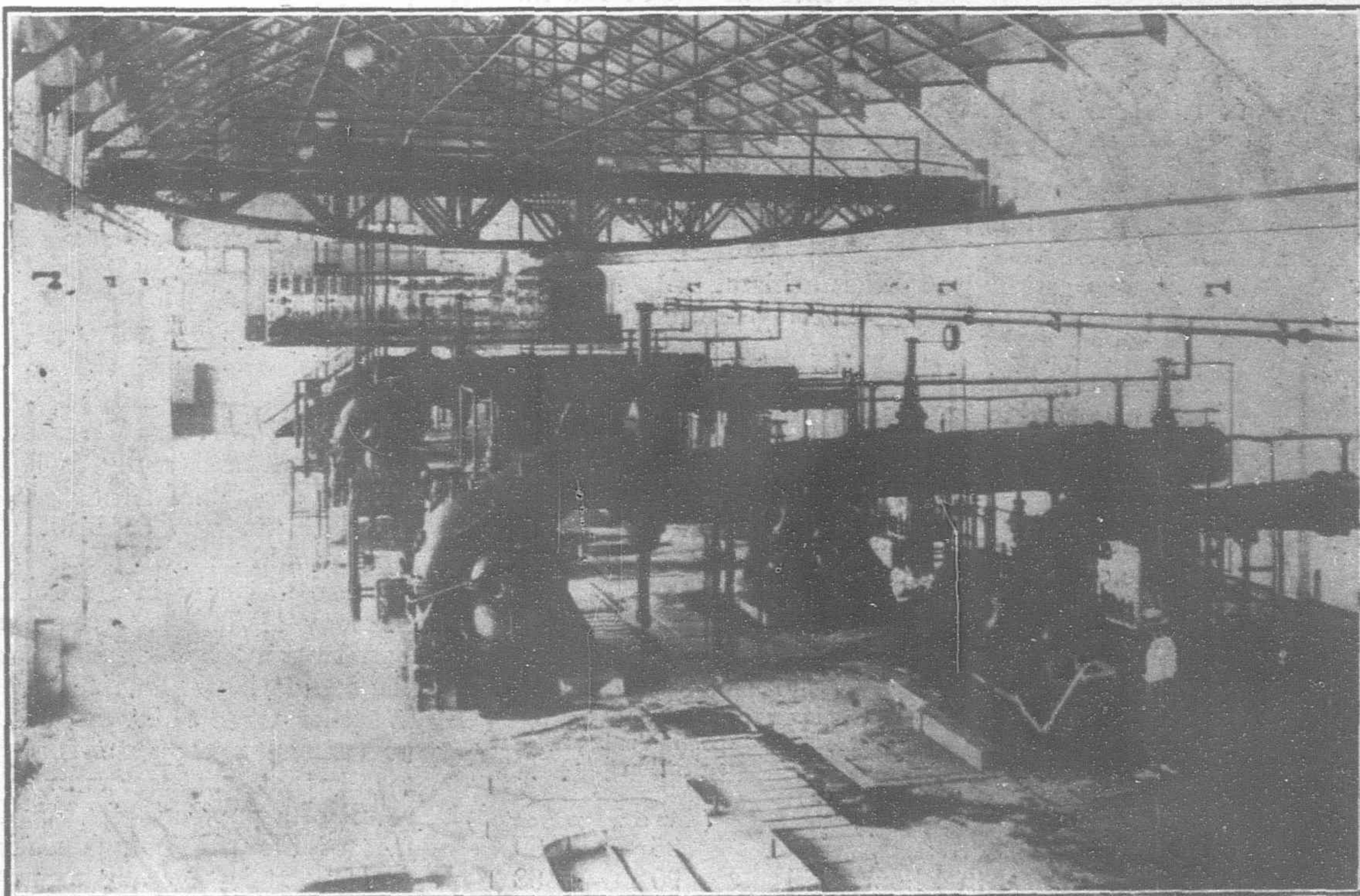
is situated at the central part of the District and is to be installed with seven large storm water pumps of a total capacity of 700 cubic feet per second and five sewage pumps of a total capacity of 100 cubic feet per second, of which four of the former and four of the latter are equipped and operated at present.

KIBA PUMPING STATION (under operation).—Kiba Pumping Station is situated at the south part of the District and is to be installed with six large storm water pumps of a total capacity of 560 cubic feet per second and six sewage pumps of a total capacity of 180 cubic feet per second, of which four of the former and four of the latter are under construction at present.

Haneda Sewage Disposal Works

(The proposed project for the District No. 1)

Haneda Sewage Disposal Works are located near the mouth of the river Rokugoh about eleven kilometers south from Shibaura Pumping Station and are designed to deal with a population estimated at 2,170,000 and the maximum d.w.f. of sewage about 14,000,000 cubic feet per day. The plant occupies the land area of about 18.4 hectares.



Pumping Station of the Mikawajima Disposal Plant

The main installations shall consist of four sets of detritus tank and screens, pumping equipments of a total capacity equal to 450 cubic feet per second with about thirty feet lift, eleven sedimentation tanks which have a total capacity of 3,500,000 cubic feet, a disinfection chamber with a mixing tank, etc. The settled sewage is discharged into the quick current off the coast of Haneda.

The construction of the works is expected to be commenced in near future. In the mean time, the sewage coming to Shibaura from those parts of the Drainage District No. 1 where the sewerage system has been completed is discharged into Shinagawa Bay after treated by the temporary installations annexed to Shibaura Pumping Station.

Mikawashima Sewage Disposal Works
(Under operation for the District No. 2)

Mikawashima Sewage Disposal Works are situated at the right bank of the upper part of the river Sumida, and occupies an area of 18.5 hectares. The existing plant deals with the maximum d.w.f. of sewage of 2,760,000 cubic feet per day. An ample space is provided for the future extension to deal with a population of 600,000 and total d.w.f. of sewage of 4,140,000 cubic feet per day.

The main installations consist of two sets of detritus tank and screens, pumping equipments of a total capacity of 165 cubic feet per second with about twenty-eight feet lift, five sedimentation tanks which have a total capacity of 588,000 cubic feet, twenty-eight trickling filters, which have a total area of 308,000 sq. ft. with fourteen pairs of sewage distributor driven by electric motor, and two humus tanks and two sludge tanks, etc.

The effluent is discharged into the river Sumida.
In addition, the following experimental installations are constructed, and the further investigations are still going on.

- (a) Activated sludge process, by mechanical agitation of Sheffield type capable of dealing with 110,000 to 160,000 cubic feet of sewage per day.
- (b) Activated sludge process, by air blowing to deal with 5,000 cubic feet of sewage per day.

Sunamachi Sewage Disposal Works
(Under construction for the District No. 3)

Sunamachi Sewage Disposal Works are situated at the mouth of the river Shin-Arakawa, and are designed to deal with a population estimated at 670,000 and the d.w.f. of sewage of 4,600,000 cubic feet per day.

The main installations are ; the pumping equipments of a total capacity of 140 cubic feet per second with about twenty-one feet lift, four sedimentation tanks of a total capacity of 1,533,000 cubic feet, and two storage reservoirs for the time of flood tide, etc. .

The settled sewage is discharged into the sea at the time of ebb-tide. Greater part of the installations should be completed and put into operation about March 1, 1930.

Results of Operation and Experiments at
Mikawashima Works

The following few items are the important results obtained from the operations of Mikawashima Works and the annexed experimental installations.

- (a) The sewage arriving at Mikawashima, is to be called as "medium" in its character, having the following average analytical results.
Total suspended matter ... about 300 parts per million
Oxygen absorbed in 4 hours... " 50 " " "
Albuminoid ammonia as nitrogen ... " 7 " " "
- (b) The preliminary sedimentation of the sewage from 4 to 6 hours before applying the activated sludge process, has no favorable effect on the treatment.
- (c) The average percentage of purifications obtained by different methods are as follows :

	Trickling filters (settled sewage treated)	Activated sludge process	
		by mechanical agitation	by air blowing
		(raw sewage treated)	
On suspended matter ...	80	85	80
On oxygen absorbed in 4 hours	85	90	88
On albuminoid ammonia as N.	77	80	80
On B coli groups ...	95	98	95

- (d) In the mechanical agitation process, agitation or splashing of the mixed liquid at the water surface is absolutely necessary for the aeration of sewage ; and the circulation in long channels is less effective except that to mix the liquid and sewage. In our experiments by shortening of circulation channels with reduction of 78 per cent. in volume of aeration tank, the period of aeration shortened to five hours from its initial period of twenty hours and the power used reduced to two-thirds, without any appreciable effect on percentage of purification.
- (e) When a part of activated sludge in mixed liquid is allowed to be settled in the bottom of aeration tank, the decomposition of sludge proceeds without any appreciable interference to aeration which decreases the excess sludge to a great extent.

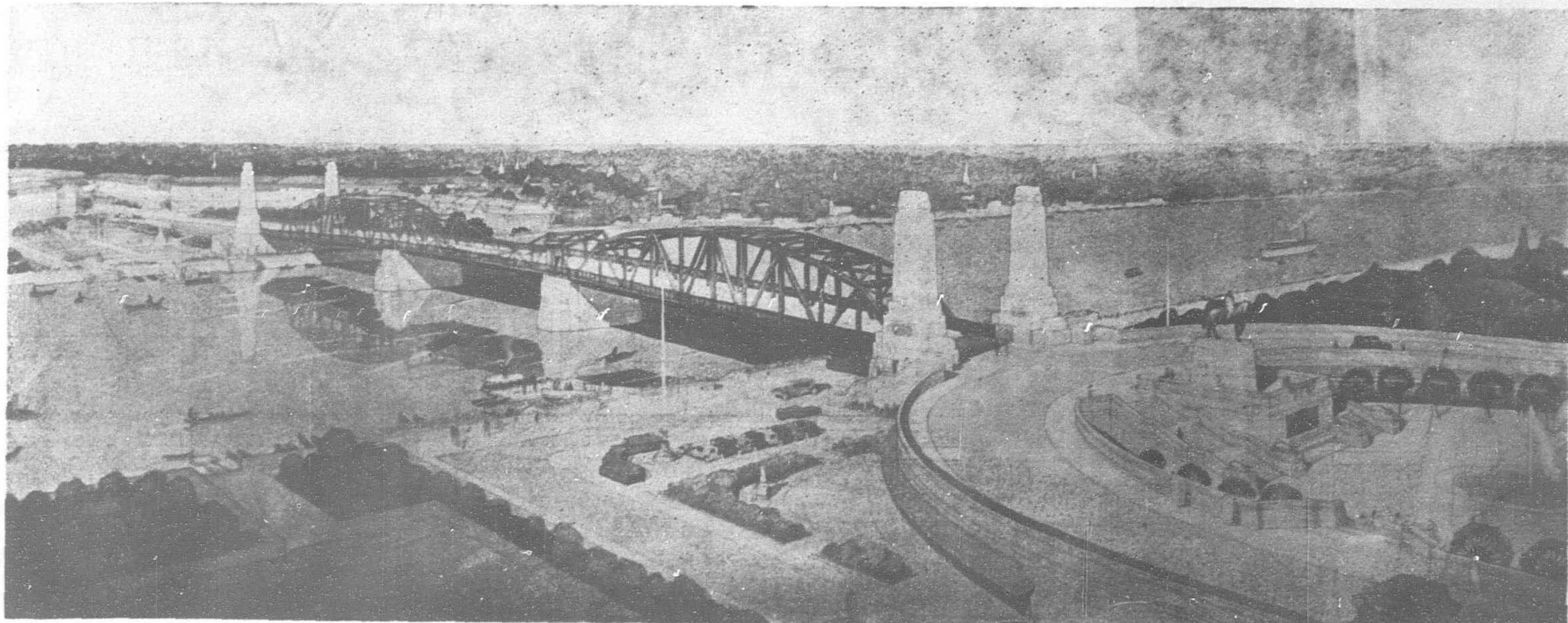
The Modernization of the Chinese Government
(Continued from page 148).

blessings. They want railroads, roads and bridges ; they want ample educational and health facilities ; they want the improvement of agriculture and the promotion of trade ; they want protection of life and property ; they want to participate in government and to determine its policy. A Government to meet these wants adequately must have an adequate administration and broad statesmanship, but it must also govern a territory which its wealth, its resources, its financial power, its administrative genius can handle. Otherwise, its energy becomes so dissipated that no matter how ardent its aspirations or how great its achievements, the people see these things diffused and complain at the lack of accomplishments. That has been the particular difficulty of the Nanking Government. A concentration of effort territorially will without question, produce at any rate, in the heart of China, a greater confidence in the Chinese Government—a confidence which in turn will transfer itself by a sort of osmosis to the whole people of China and eventually to the Powers.

Book Notes—(Continued from page 151.)

occasionally is too condensed to be absolutely accurate, but that presumably is unavoidable unless one write without regard to time and space. But these are mere details. In the entire chapter on the Period of Political Tutelage, I have found only one major error and that is a confusion of the functions of the Central Supervisory Council and the Control Yuan, which is remarkable, when one considers that the Kuomintang is attempting a new departure in the science of Government and that the system it has produced is so intricate and involved that few quite grasp even its mechanism to say nothing of the principles underlying that mechanism.

The Kuomintang is not an accident nor is it a mere outburst of student propaganda, as some suppose. It is a living force which came into existence because there was a need in China for some political group which would represent a distinctively Chinese reaction to the impact with Western civilization. Mandarinism could not develop such a group because the essence of Mandarinism was the essential paternalistic relationship between subject and ruler which Confucian politics had developed. This paternalism was characterized by a governmental structure based upon two factors only, namely the maintenance of order and the collection of revenue. Mandarinism functioned successfully as long as the social characteristics of western Governments were not known in China. It functioned successfully as long as the West did not pound down China's sea-gates. But once China became a part of the world, Mandarinism was doomed. This was manifestly inevitable but what would take its place ? This question has not been solved, because China is in transition and evolution. The Kuomintang ideology of Sun Yat-sen provides an essentially Chinese concept based upon the same ideas as produced the Scholastic Empire of the mandarins but with a modern relationship and responsibility. Whether these ideas succeed or fail in producing a satisfactory government and system is a matter of prophecy but the important fact is that whatever is evolved by time and practice will be the result of a popular contact with these ideas. That is the essential fact of the political, educational and social condition of China to-day. It is therefore a matter of satisfaction that one can gain a satisfactory knowledge of these ideas from Professor Holcombe's book, now that it has been written.—GEORGE E. SOKOLSKY.



The New Memorial Road Bridge Over the Chow Phya River at Bangkok, Siam, Now in Course of Construction by Messrs. Dorman, Long & Company, Ltd.

New Bridges in the Far East

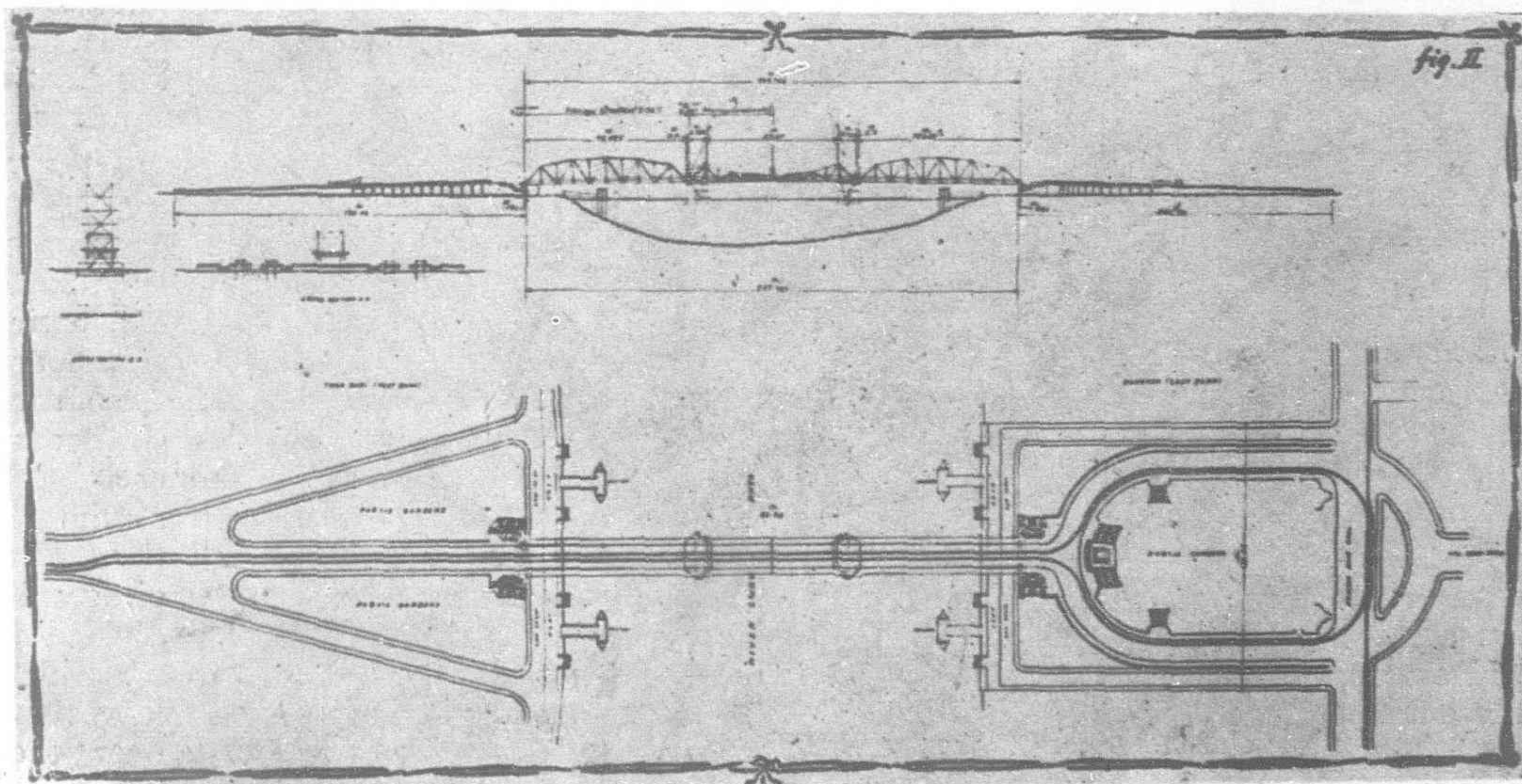
ANY important new bridges are being built in all countries of Asia, to supersede older structures designed to meet the traffic conditions of two decades ago. Heavier railway trains and the phenomenal development of motor traffic has compelled the replacement of these older structures and in many cases, the new bridges serve the dual purpose of carrying a railway line and a public road. Some of the most important structures have been erected in India, amongst which is the splendid bridge over the Jumna, near Allahabad, which carries the main railway line from Calcutta to Delhi. Here a remarkable feat of engineering has recently been achieved. The work of regirdering the bridge and of constructing a new concrete roadway under the rail track, estimated to take two years, was accomplished in nine months and at about £50,000 less than the estimated cost. The bridge is 3,200 feet long, and has 16 spans each with 450 tons of steel, nearly double the weight of steel on the old spans. In each span there were 35,800 field rivets.

The bridging of the Hooghly at Calcutta is still engaging the attention of the Government engineers and recently, alternate designs of cantilever and floating types for the new Howrah bridge were given publicity. The floating design is estimated to cost £1,532,000 and the Cantilever design £2,656,000. The Siamese Government has placed a contract with the well known British firm of Dorman, Long & Company, Ltd. for the erection of the Memorial Bridge over the Chow Phya River at Bangkok. This is to be of the bascule type and will cost £262,288. The Canton Government has signed a contract with the American firm of Andersen, Meyer & Company for the erection of a bascule bridge over the Pearl River connecting Canton with Honam, to cost over a million gold

dollars. Last year, Mr. Sun Fo, the Nationalist Minister of Railways invited Dr. J. A. L. Waddell, the American bridge expert, to design the new bridges for the Government railway system. Many of the older structures are entirely too light to carry the increased loads imposed by heavier trains and traffic and in addition there are several highly important projects for new bridges over the Yangtze River to connect the north and south railway systems.

Two of these structures are projected to link the Peiping-Hankow with the Canton-Hankow lines by a bridge over the Yangtze at Hankow, while another is designed to carry the road traffic across the Han River between Hankow and Hanyang. The old Yellow River Bridge of the Peiping-Hankow line is to be replaced as soon as conditions warrant. In the north, the Chinese Eastern Railway Administration has replaced the old bridge erected in 1896 over the Sungari River on the southern branch of the line between Harbin and Changchun. This contract was carried out by the Skoda Works. The C.E.R. Railway Administration is now inviting tenders for the erection of eight spans to replace the old bridge over the Sungari River at Harbin.

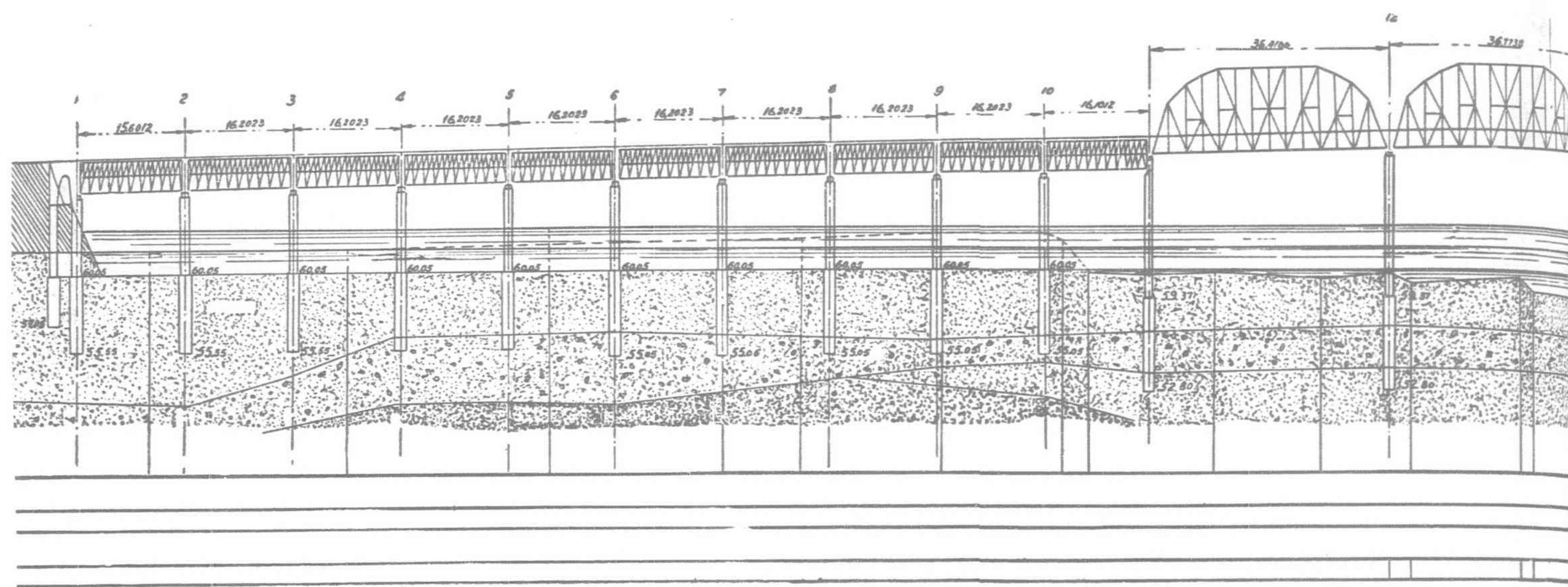
Many new bridges have been erected during the past few years in Japan and at the present moment, the Tokyo Municipal Government is calling for tenders to construct a new bascule bridge over the Sumida River at Tsukiji. The outstanding features of several of these new bridges in Eastern Asia are given below. Owing to certain changes in the original plans of the Canton bridge and to checking up essential data for the Yangtze and Han River bridges at Hankow, publication of the plans and specifications for these projects will appear in a later number of this magazine.



Elevation, Plan and Lay-out of Approaches to the Memorial Road Bridge at Bangkok

BRIDGE OVER THE SUNGARI RIVER (FIRST

(8 Spans at 35.00 Sajen with Traffic Below and



New Chinese Eastern Railway

Bangkok Memorial Road Bridge

The contract for the supply and erection of this bridge was recently secured by Dorman, Long & Company in keen competition with the leading bridge builders of other countries. It is to be built across the River Chow Phya in the middle of Bangkok to connect the two halves of that city which have a combined population of approximately three-quarters of a million, and its special object is to commemorate the 150th anniversary of the foundation of the city. H.M. the King of Siam, recognizing the unique occasion, personally presented the land on the Bangkok side, as the site selected was situated on his private property. His Majesty also desired to pay half the cost of the project from his privy purse.

The contract, which was let for a sum of £262,288, consists of the supply and erection of a road bridge approximately 230 metres in length, with a central opening span of the bascule type, giving a clear passage of 60 metres. The roadway is 10 metres wide between kerbs and the bridge also carries two footways each 2.5 metres in width. The approaches from both sides pass through ornamental gardens, and vertical embankments with pontoon landing stages are also provided at either side of the river.

The Consulting Engineers were Messrs. Sandberg, Consulting Engineers to the Royal State Railways of Siam.

The illustrations on the preceding page show an architect's drawing for the bridge and the elevation, plan and layout of the approaches.

From Chakra Bejr road on the East bank the approach is

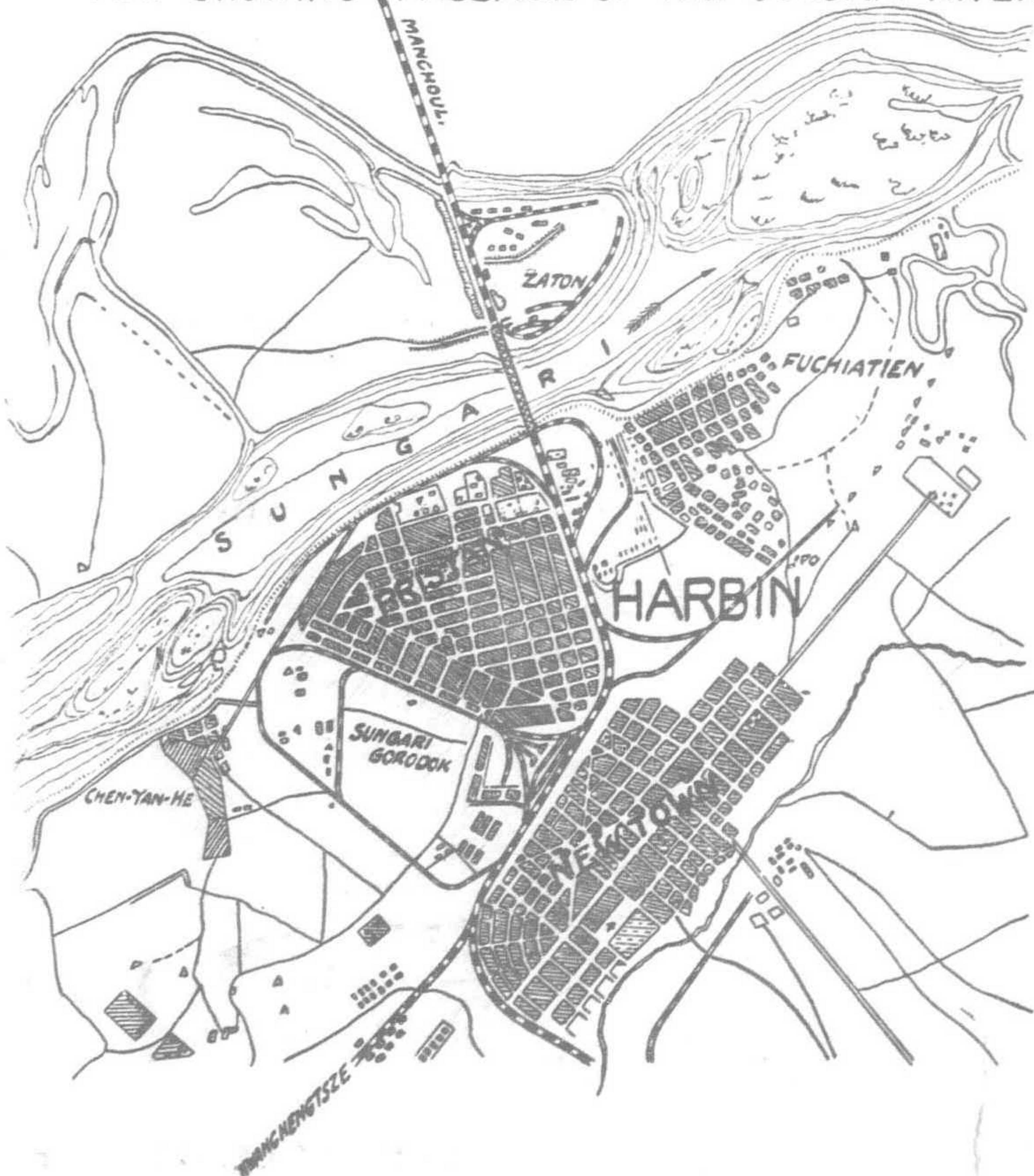
in the shape of a U. and rises about 3 per cent. towards the abutment.

The memorial statue of the 1st. King of the Chakri dynasty H. M. Somdej Phra Budha Yod Fa will be placed at the bend of the U. Between the two arms of this approach is a public garden 70 m. wide. There is a bunding wall of reinforced concrete sheet piles along the bank of the river and behind this a promenade runs underneath the bridge and turns on both ends to run outside of and parallel to the arms of the approach and come out at Chakra Bejr Road. The distance from the bunding wall to the front of the abutment is about 19 m. The portion underneath the curved part of this approach is to be made into shops.

On the West side the approach is a straight one, being along the axis of the bridge. Similar bunding wall and promenade are also to be constructed with two low level roads to meet at the end of the approach as shown in the plan. The ceremony of laying the foundation stone was performed by H. M. King Prajadhipok at the East abutment on the 9th January, 1930.

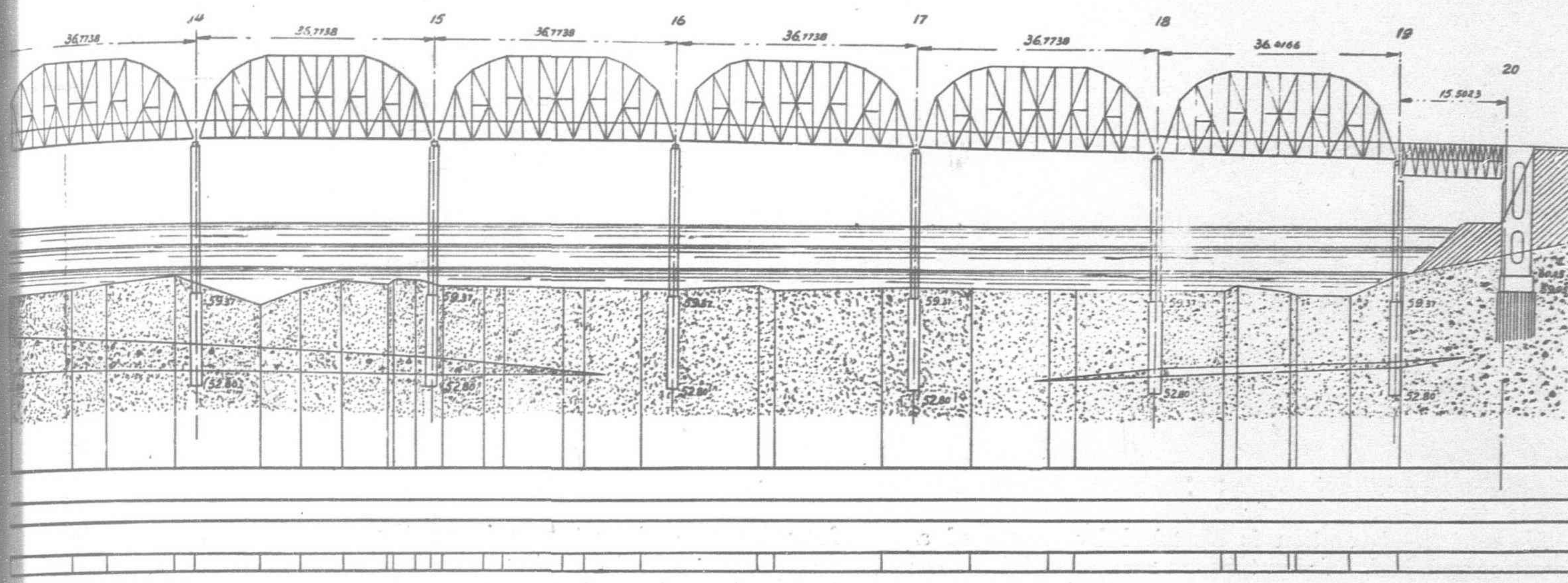
1. *Superstructure.*—This consists of two fixed steel lattice girder approach spans, each of length 75.25 m. center to center of bearings, and two lattice girder opening leaves having a total length between the tail pin and center line of the bridge each of 38.4 m. providing an opening 60 m. clear between piers. Each of the fixed approach girders is 11.27 m. deep and divided into 10 panels of 7.52 m. The two openings bascule leaves are each 7.62 m. high over the main trunnion and divided into a single panel 7.52 m. long between the main

MAP SHOWING PASSAGE OF THE SUNGARI RIVER



CROSSING) WITH OPENING OF 445.00 SAJEN

11 Spans at 15 Sajen with Traffic Above)



Bridge Over the Sungari

trunnion and the tail trunnion and five panels of 6.16 m. over the opening. The girders both of the fixed and opening spans are in one line, 11.27 m. apart center to center, giving a clear width of 10.60 m. between steelwork. The girders carry a steel frame floor system upon which will be laid a ferro-concrete floor for the fixed spans and timber for the opening spans in order to lighten the weights of the bascule leaves. The fixed approach spans are supported on the river piers directly on a steel framework embedded in the concrete of the pier and at the shore ends upon cast steel expansion bearings. The bascule leaves rest upon trunnion bearings, carried upon the same framework. The bridge is graded upwards from both ends with a grade commencing at about 3 per cent. at the two abutments, which is reduced to level at the center line of the bridge by a gradual variation.

2. *River Piers.*—Two wide river piers are required to carry the bearings of the fixed spans on the shore side and the trunnions of the bascule leaves on the inner side. The upper portion of each pier is hollow, so as to enable the tail end of the bascule leaf to fold within it upon opening and to accommodate the operating mechanism below the floor of the bridge. For this portion of the pier the concrete in the walls and floor will be water-proofed and the floor arranged with drainage slopes to a sump, in which an automatic, electrically driven pump will be provided, so that any small amount of water entering the pier will be pumped out when it rises to a predetermined level.

The loads from the fixed and moving span bearings are carried on a heavy steel-work frame at a level below this hollow portion, resting on steel grillages built into the concrete walls of the piers. At this point the pier is stiffened by the provision of heavy floor of reinforced concrete.

The outside of the pier has vertical walls and is shaped to provide a cutwater at each end up to just above low water, at which level the cutwaters are stepped back to a vertical face. The width of this part of the pier is 10.2 m. and the length

over cut-waters 20.00 m. and above the cutwaters 14.00 m. At a point just above the bed of the river, the pier is widened on one side to equalise pressure on the base.

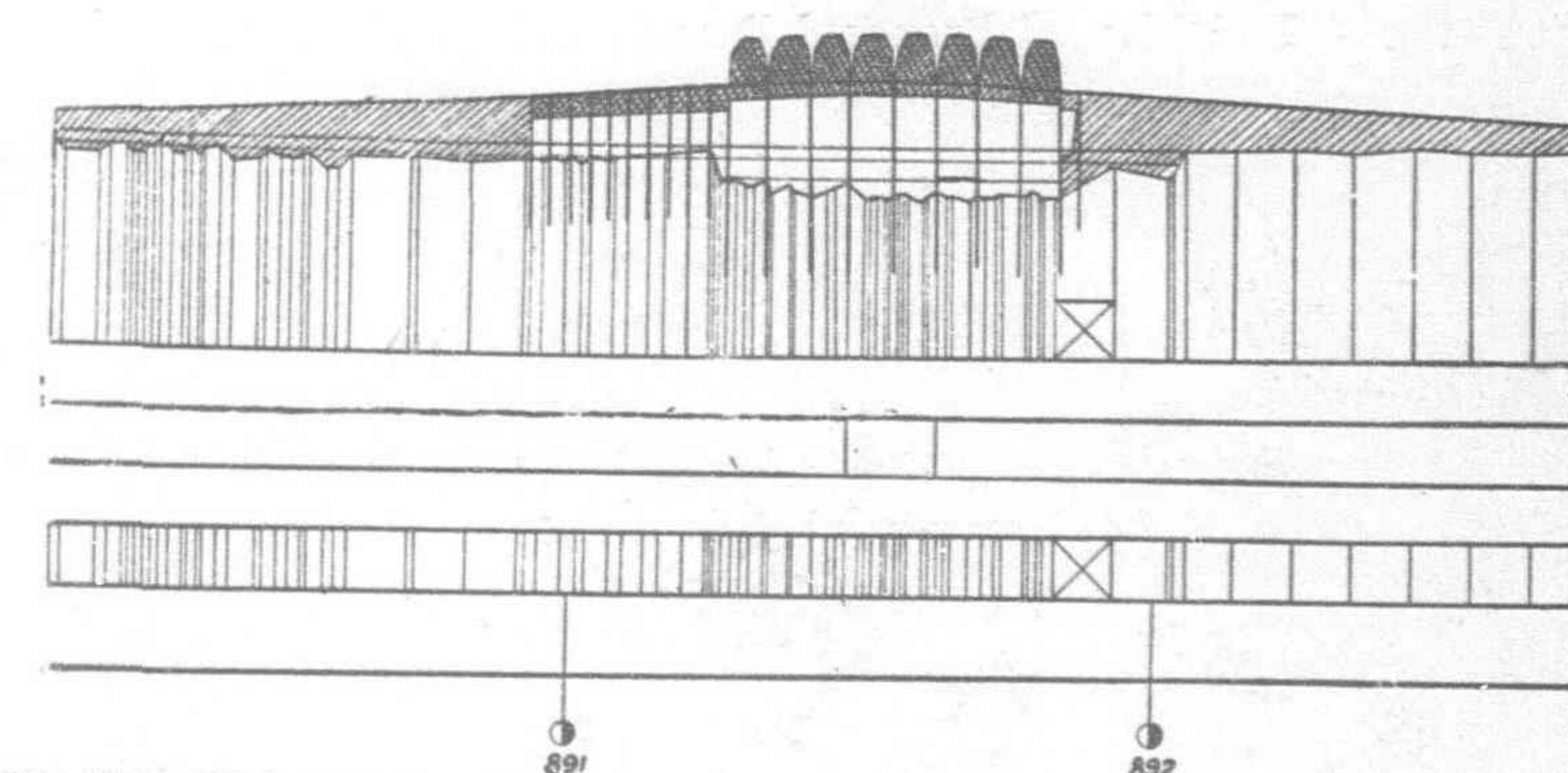
Below the upper hollow portion where the machinery is housed, the pier is formed with large voids, water filled, to reduce base pressure. The outer walls are 1.22 m. thick, with a central stiffening wall of .92 m. These are further thickened at level 15.7 m. just above bed of river, to 1.37 m. and 1.07 m. respectively. The working chamber and about 1.25 m. above it will be filled with solid concrete over the whole area of the base, forming a solid footing about 3.7 m. thick.

A scarcement is provided about $\frac{1}{4}$ m. below low water level, allowing for adjustment in the position of the upper portion and its steelwork and mechanism, should there be any slight discrepancy in the exact position of the caisson after sinking. The piers will be sunk by the compressed air method in steel caissons. The walls and floors of the piers will be composed throughout of concrete of four parts of properly graded aggregate of mixed stone and sand of approved quality to one part of Elephant brand cement except in the working chamber seal, which will be 8 to 1. The concrete will be reinforced where required with round bars or old rails. The caissons will be sunk to a level not less than 30 m. M.S.L. and may be sunk deeper up to a maximum of 33 m. M.S.L. if required.

3.—*Abutments.*—The abutments at each end consist of a reinforced concrete wall about 1.22 m. thick, extending across the

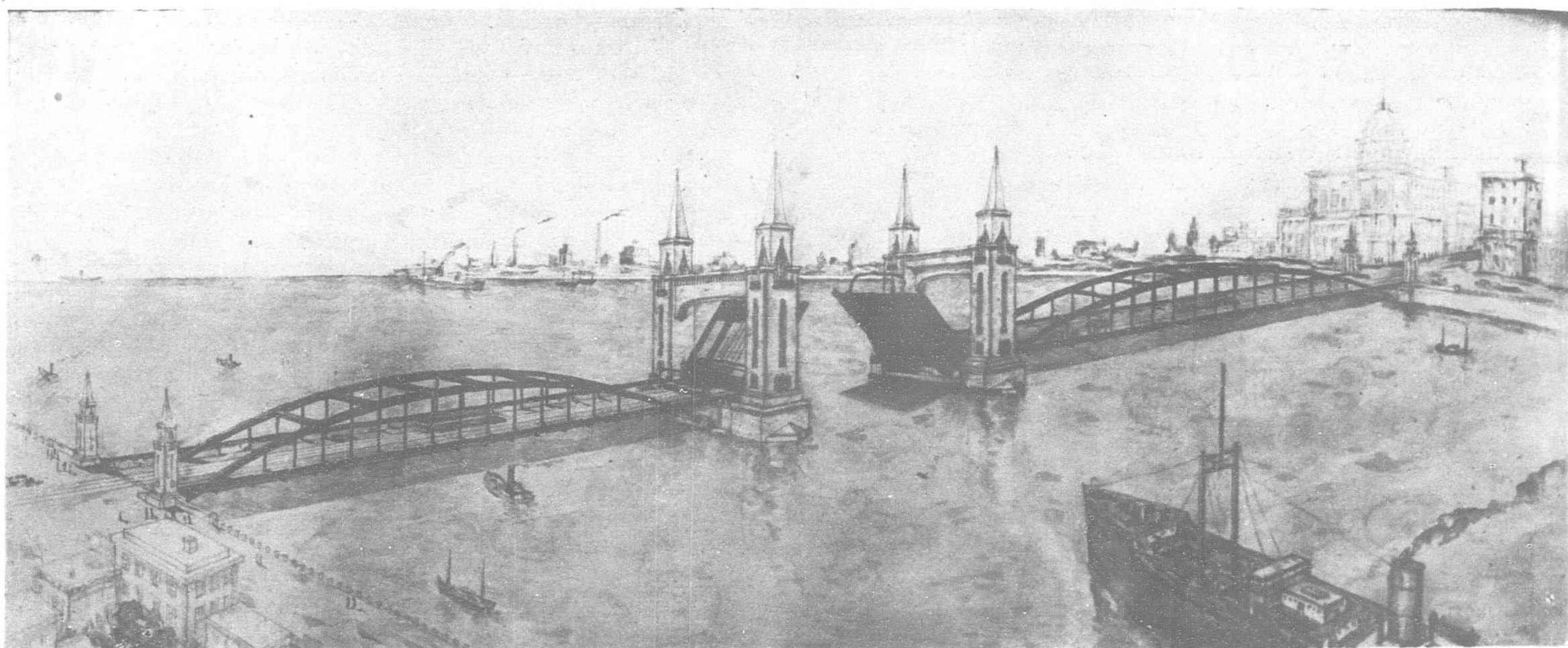
full width of the bridge under the bearings, designed to carry longitudinal and lateral loads, as well as the vertical loads from the bearings. The wall has a footing of reinforced concrete, forming a cap to a group of Vibro piles, spaced approximately 1.2 m. apart. The pile is assumed to carry a load of 20 tons. A pile test will, however, be carried out and the number of piles rearranged in accordance with the actual test results obtained. The back of the wall is extended upward to carry the end of the reinforced concrete viaduct approach.

Longitudinal Section of Passage of Sungari River



REMARK: FIGURES INDICATED IN SAJEN

1 SAJEN = 7 FEET
1 VERST = 500 SAJEN



Architect's Drawing of Proposed Bascule Bridge Over the Sumida River at Tokyo Connecting Tsukiji with Tsukishima

4. *Mechanism.*—Operation is electrical by means of a 50 H.P. motor for each leaf, driving through rack and pinion gearing, a pair of circular racks being fixed inside each pier. Both leaves are operated from one cabin situated on the deck of the Eastern pier, a similar cabin being provided for symmetry on the Western pier.

Each leaf rotates, on opening, around a trunnion carried on the steel framing in the pier, and the tail end descends, as stated above, into a hollow portion in the top of the pier, the tail end carrying a counterpoise from a trunnion, designed to balance the dead load of the leaf about the main trunnion. In its closed position, the tail end rests against the steel framework and is securely locked in position by wedges at the end and at the center where the two leaves meet, these being operated electrically.

Two independent brakes for each leaf are provided, operated automatically or, alternatively by hand, and a safety lock for the bridge in the full open position is also provided. Brakes and gear are designed to sustain a pressure of 150 kgs. per sq.m. but the motor and gearing are designed only to open the bridge against a 50 kgs. per sq.m. wind. Barriers are provided across each footpath and the road, near the end of the fixed flanking spans.

The whole of the mechanism is carefully interlocked in such a manner that each operation necessary to open or close the bridge is automatically performed in the proper sequence and the signals and navigation lights and operation of the barriers are also interlocked with the mechanism. Auxiliary mechanism is provided, by means of a petrol engine on each leaf, in case of breakdown of the main gear. The main gear would open the bridge or close it in about five minutes and the auxiliary gear in about 15 minutes, including time for opening the gates, wedging, etc. Operation would be per-

formed entirely from the cabin on the Eastern pier, but there would be an operator on the Western pier whose duty it would be to close the gates at the end and control traffic.

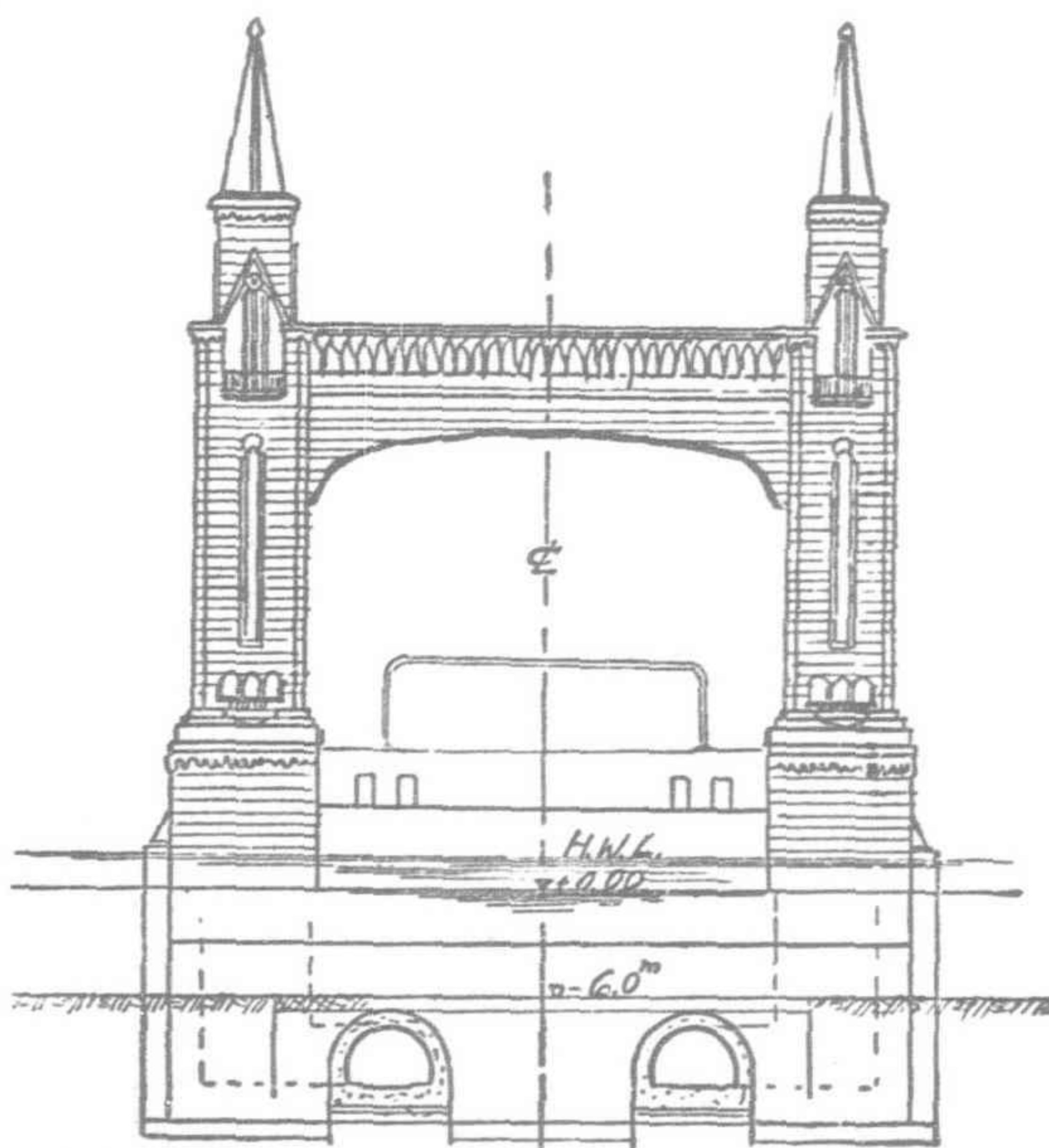
Chinese Eastern Railway Bridge

One of the most important bridge contracts now pending in the Far East calls for the replacement of the Chinese Eastern Railway bridge over the Sungari River at Harbin. Last year the old Chinese

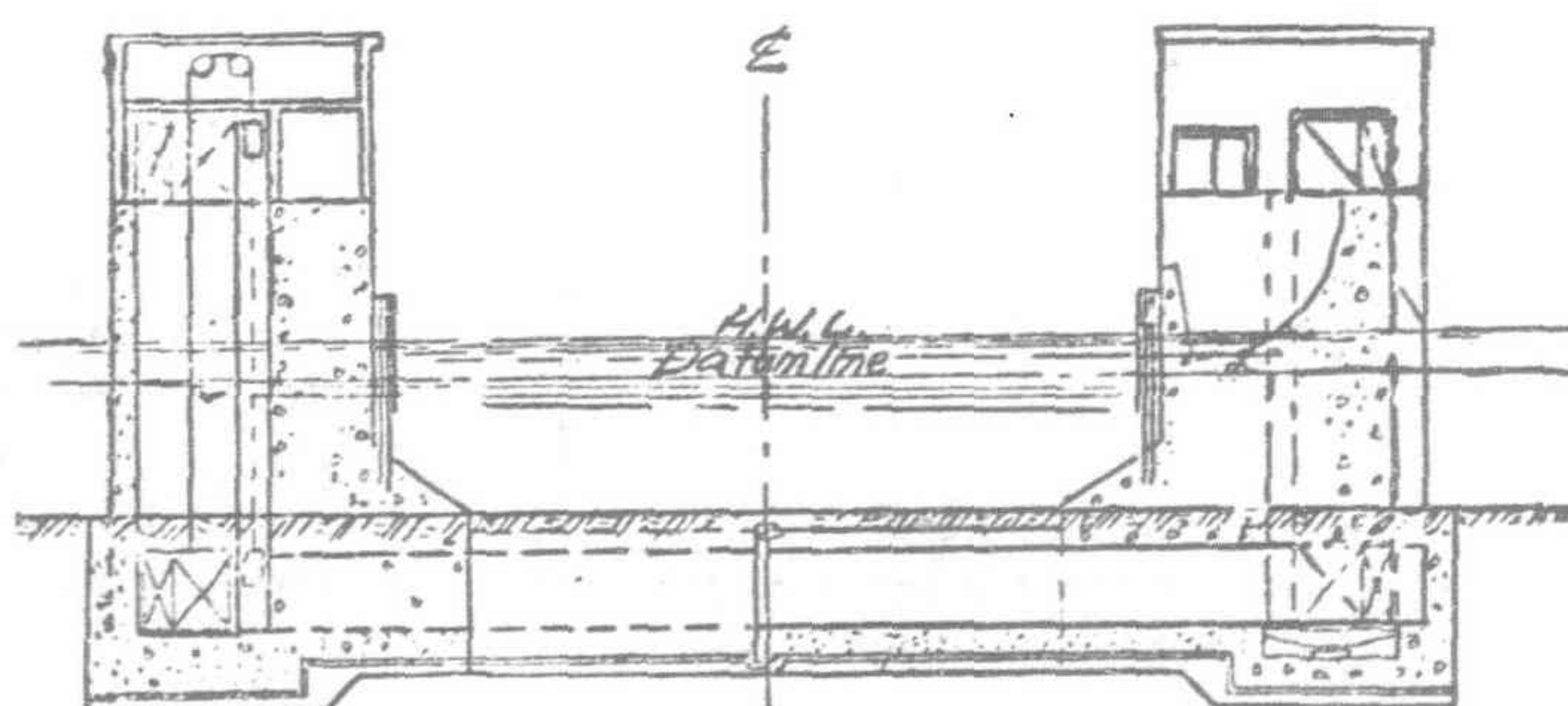
Eastern Railway Bridge over the Sungari at Laoshagow on the Southern line between Harbin and Changchun, was successfully replaced by a heavier structure, under a contract with the Skoda Works. It was planned to proceed immediately with the replacement of the longer bridge over the Sungari at Harbin but political difficulties with Russia compelled postponement of the tenders. As conditions are now stabilized, the Chinese Eastern Railway Administration has issued plans and specifications outlining the main features of the proposed bridge and invited tenders from leading bridge builders. The plans call for the erection of eight spans of silicic steel, 76.8 meters long each, weighing, with footpaths, about 298 tons each, making a total of about 2,385 tons. The contract provides for the delivery of material on the job and its erection on the old piers, construction and of scaffolding for demolishing the old structure and erecting the new spans: disjointing and removing the old spans

and upon completion of the job, the clearance of the river of piles and scaffolding and removal of all temporary structures. The contractor is at liberty to devise and follow his own methods in the execution of the job.

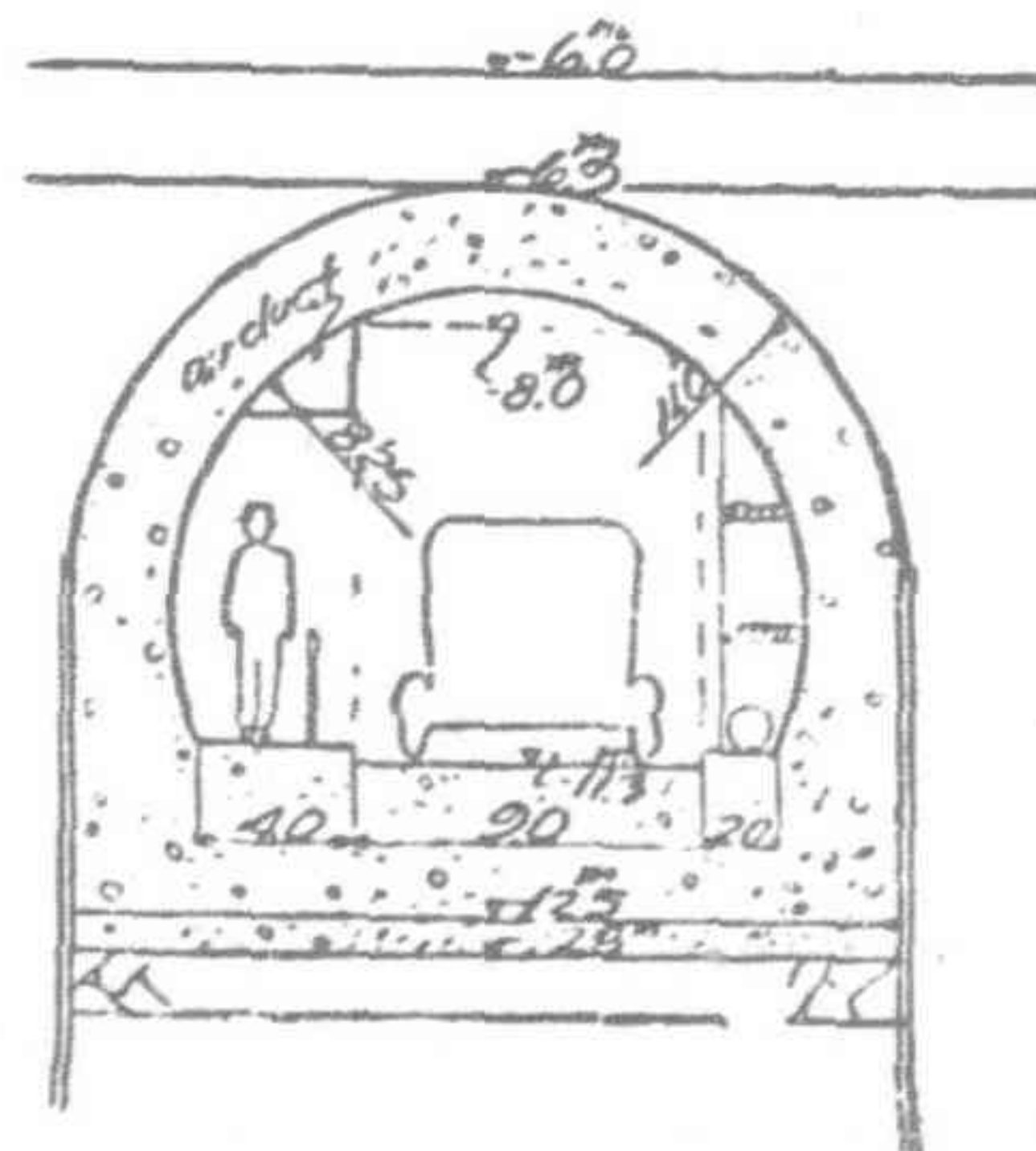
Tenders for the contract are to be based on a flat price per metric ton of steel of spans



End Plan of Proposed Bascule Bridge at Tokyo



Plan of Bascule Section Showing Method of Handling Traffic When Open



Automobile Tunnel Under Bascule Span

in place and shall also indicate the total amount, which shall represent full compensation for the completed job.

The first four spans of the bridge from the Harbin side of the river must be replaced not later than March 15, 1931, and the scaffolding removed and the river cleared for navigation before work on the other four spans can be commenced. These must be in place by March 15, 1932, and the entire job completed by September 15, 1932. Six hours time is allowed for the actual replacement of each span, with a penalty of \$100 gold for each hour's delay and a premium of \$200 gold for each hour saved.

Full specifications and conditions of the contract will be furnished on application to the Chinese Eastern Railway Administration at Harbin.

New Bridges in Japan

Latest Practice in Bridge Engineering in Japan

The completion of the Reconstruction Program for Tokyo and Yokohama forces attention to the remarkable progress made by the Japanese engineers in modern bridge construction. When the old bridges over the Sumida River at Tokyo were replaced after the Earthquake in 1923, the Reconstruction Bureau invited the Foundation Company of New York to sink the caissons for two of the most important structures and so well have the Japanese mastered American methods, that in the last four years they have sunk thirty eight similar caissons in various parts of the country without accident. In a paper read before the World Engineering Congress held in Tokyo last November, Mr. Y. Tannaka of the Engineering Staff of the Japanese Government Railways, says that the advancement made in bridge engineering in Japan is due in the first place to the adoption of the methods of Western civilization and later to the incessant efforts of our senior professors and engineers.

"In order to meet the necessities due to the recent construction and improvement works of roads and railways, we have built a great number of bridges to almost all kinds with fixed spans, excepting extraordinary long span bridges, and some types of movable spans. But we aim at continuous advancement, and are anxious to profit by the useful advice and suggestions to be given us by the experts from the different countries of the world.

STANDARD LIVE LOADS.—For highway bridges and city bridges, the following live loads are specified by the Department of Home Affairs.

For first class bridges:

Uniform human loads;

120 000

————— ≤ 600 kg/sqm for roadway,

170 + l

100 000

————— ≤ 500 kg/sqm for foot-path,

170 + l

where l = span length in m;

1—Motor-truck of 12 tons;

1—Road-roller of 14 tons;

Tramway cars to which the bridges shall be subjected. *)

For second and third class bridges, the lesser live loads are similarly specified.

The dynamical effect of the live load or impact is specified as to be considered only for motor-trucks and tramway cars by the formula,

$$i = \frac{20}{60 + l} \leq 0.30,$$

where l = loaded length causing the max. stress in m.

For the railway bridges of the Japanese Government Railways, the Department of Railways specifies three kinds of load class; namely, KS-18 (Cooper's loading E-40, metric system), KS-15 (E-33) and KS-12 (E-26), for the first, second and third classes of railway lines, respectively; and also specifies the following impact formula for steel bridges.

$$i = \frac{45}{45 + nl},$$

where i = impact coefficient,

l = loaded length causing max. stress in m,

and n = number of tracks.

The private railway companies specify usually one of the loadings above mentioned, or the other conventional load system.

In Chosen, the Chosen Government Railways also specify three kinds of load class; namely L-22 (E-50), L-18 (E-40) and L-15 (E-33) for railway bridges.

MATERIALS.—The properties of the principal materials for bridges are specified by the Japanese Engineering Standards, and the allowable stresses of structural steel are generally specified as 1200 kg/sqcm for the primary stresses in tension, 1000-1100 kg/sqcm as max. for compressive stresses, to be reduced according to the slenderness ratio of the compressed members, 900 kg/sqcm for shearing stresses of the plate etc., and as for the concrete of superstructures, the allowable stresses are apt to be specified as 43-53 kg/sqcm for compressive stress etc., on the basis of the field test principles.

As the usual biggest shapes of home-made structural steel, we use 200.-200.19 mm angles, 380 mm channels and 600 mm I-beams; and as bearings or pedestals of bridges, we use a great deal of steel castings. The biggest castings ever used by us weigh 13 tons apiece.

As the structural special steel, the Ducol steel is the only material ever used in this country. Ducol steel which we have used for the main tension members of Eitai-Bashi and Kiyozdu-Bashi, the two largest bridges over the Sumida in Tokyo, was made by the Kawasaki Dockyard in Kobe, and had the specified properties given below.

Chemical compositions :— C. 0.2-0.3%, Si. 0.1-0.2%, Mn. 1.4-1.6%, P. <0.035%, S. <0.03%, Cu. <0.16%.

Physical properties :— Ultimate strength 6300/sqcm, Yield point 3960/sqcm, Limit of proportionality 3470/sqcm, Elongation for 20cm not less than 18%.

(Allowable stress specified 1700/sqcm for primary stress in tension).

TYPES OF SUPERSTRUCTURES AND BRIDGES LATELY BUILT.

—(a) *Steel Bridges.*—For bridges of short and moderate span length, rolled beams, plate girders, Warren girders, Pratt trusses, solid and braced rib arches are in frequent use, and for highway and city bridges of moderate span length, tied arches and two hinged arches are extensively used.

(b) *Reinforced Concrete Bridges.*—Up to about 10 metre span, we use slabs or beams, and for the greater spans, bridges of the rigid frame types, transformed catenary arches, etc.; recent constructions of reinforced concrete viaducts for the elevated railways are also worth noting.

(c) Some notable bridges lately built are shown in the accompanying figures.

SUBSTRUCTURES.—Piers and abutments of bridges are usually built of concrete or reinforced concrete upon pile foundations, while for the necessities of deep foundations, we use reinforced concrete wells or the pneumatic caissons. In later years, steel piles are also extensively used for foundation works.

The pneumatic method which was introduced by the Bureau of Reconstruction under the supervision of the Foundation Company, N. Y., is now well mastered by Japanese bridge engineers and in these four years thirty eight caissons have been sunk without accident.

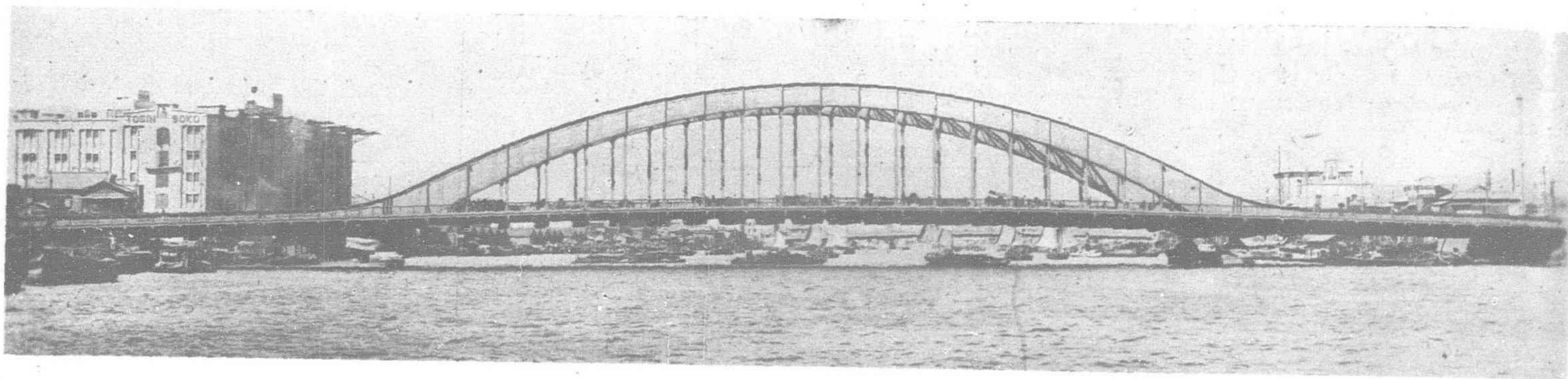
FABRICATION OF STEEL BRIDGES.—We have now a number of first class companies for the fabrication of steel bridges, and their total fabricating capacity is estimated as about 140,000 tons per year. Each of these companies has a steel plated full-size drawing floor, well equipped workshops, with drills, shapers, power riveters, erection yards, cranes, etc.

ERECTION OF STEEL BRIDGES.—The methods of erection of railway bridges have been greatly improved in recent years. Plate girders are usually spanned by the erection cranes or by the rolling out method using proper pilot framings, and the truss girders are spanned by wire cables or by using erection trusses or erection bents. Some actual features of erection works are shown by the figures.

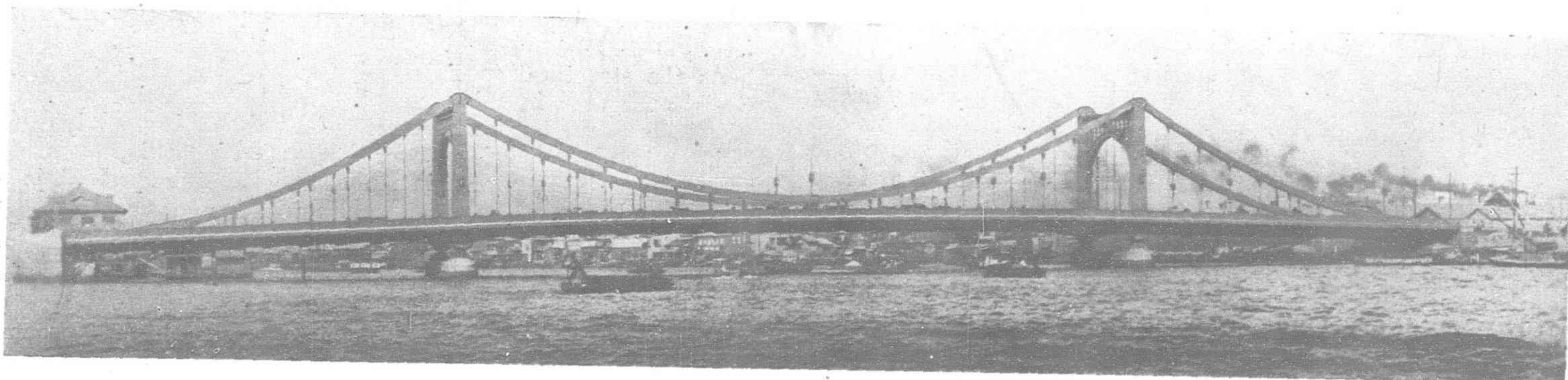
REINFORCEMENT OF OVER-STRAINED BRIDGES.—The reinforcement of over-strained railway bridges is a problem of considerable importance in Japan. Plate-girders are usually reinforced by riveting the triangular or trapezoidal reinforcing frames

* For the new bridges in Tokyo, the Bureau of Reconstruction specified 30 ton electric bogie-cars.

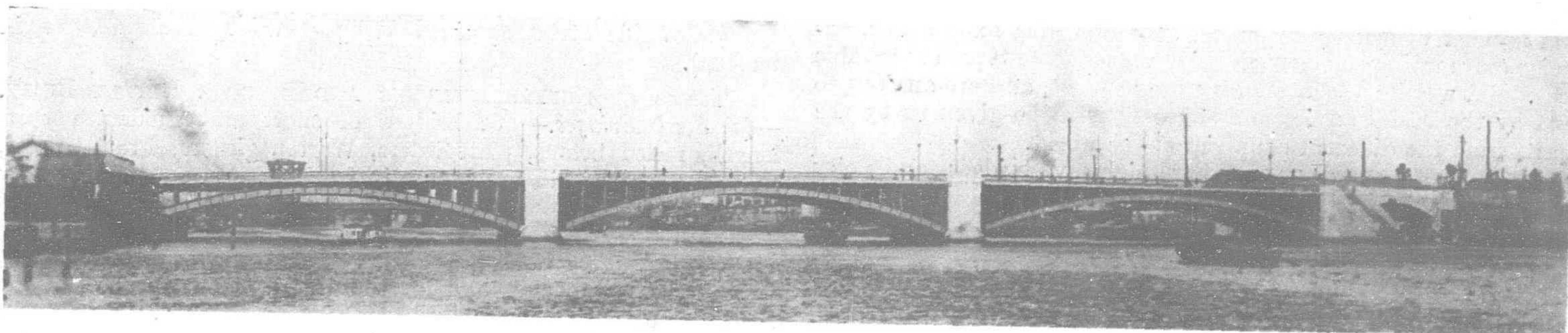
THE NEW SUMIDA RIVER BRIDGES, TOKYO



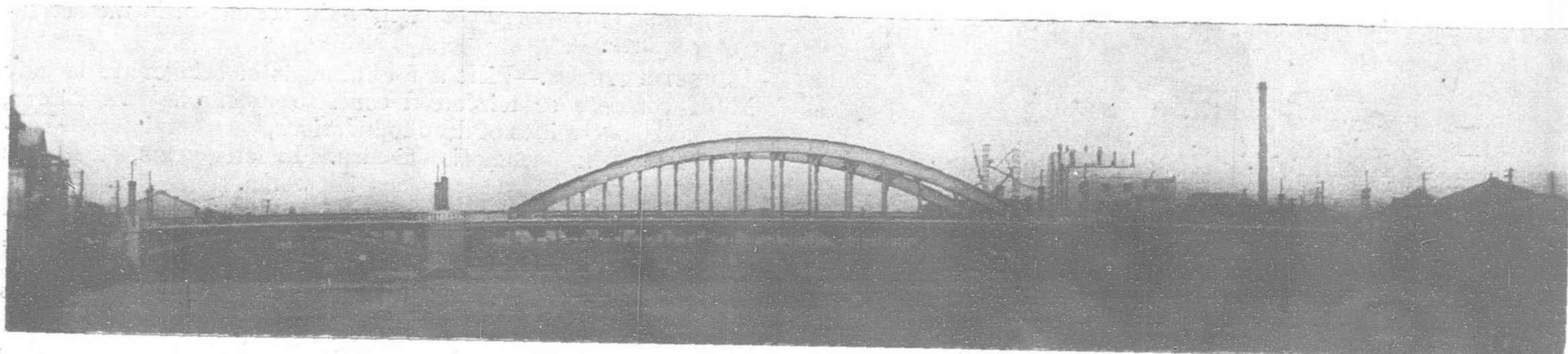
Eitai-Bashi



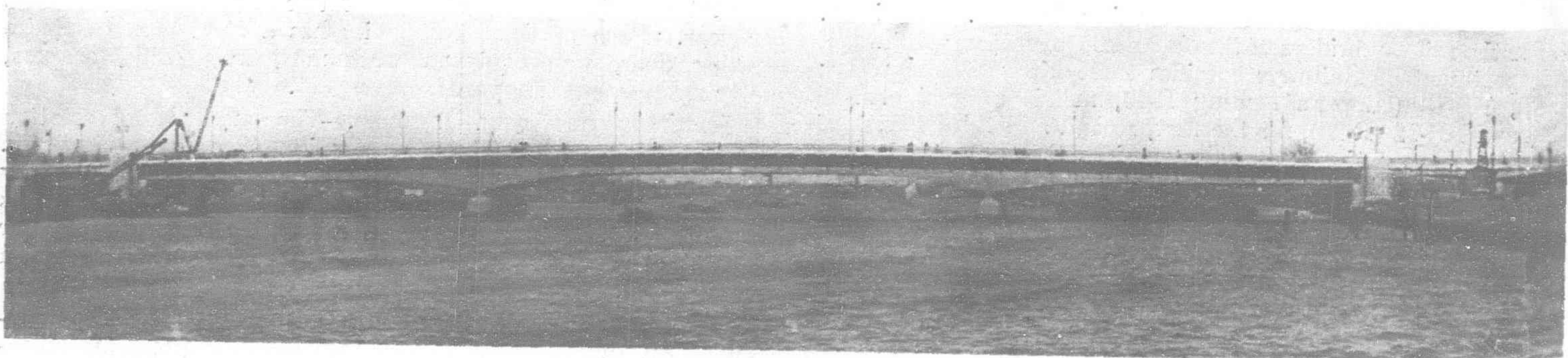
Kiyodzu-Bashi



Kuramae-Bashi



Komagata-Bashi



Kototai-Bashi

under the existing girders, or by adding a pair of similar old girders to the existing girders, while as for over strained trusses, we usually replace them by the method of side shifting, which is carried out in the train intervals.

IX. EFFECTS OF GREAT EARTHQUAKES.—Referring to the results of our inspections of the numerous bridges destroyed by the Great Kanto Earthquakes during September 1923, we may set forth the following conclusions :

- (a) Serious damage to bridges with steel superstructure was generally due to failures of the substructure or bridge bearings.
- (b) Steel superstructures for short and moderate spans were generally strong enough to withstand the inertia forces due to ordinary violent earthquakes, so far as they are designed to resist the specified lateral wind pressures and the lateral forces due to live loads.
- (c) For reinforced concrete bridges, by reason of the greater relative weight and defective properties of the concrete, the effects of earthquakes are generally more dangerous than for steel girders.
- (d) The flat arch bridges of steel as well as reinforced concrete, are generally preferable to simple girders, as they are initially designed to resist horizontal thrusts.

The strength of designed bridges is now usually checked under assumption of the provable max. seismic accelerations of the localities.

Tokyo's New Bridges

The bridges in Tokyo were, before the earthquake, mostly built of wood. In the earthquake conflagrations these bridges caught fire and were burnt down cutting off the way of fleeing refugees. In carrying out the work of reconstruction, this bitter experience was not lost sight of and the greatest caution has been exercised in amending this fault of the old bridges. In the construction of bridges the greatest care was taken to use the latest advances made in the art and science of bridges architecture, at the same time special attention was paid to make them earthquake proof. Furthermore, bridges has been increased to ensure and promote the facility and safety of communication. The total number of street bridges built in Tokyo and Yokohama as a part of reconstruction work is 523, involving a total expenditure of about Y.60,000,000.

The most interesting of these new bridges are the six great bridges across the river Sumida. The Sumida, which flows through the capital, and offers great water facilities to the commercial and industrial activities of the city is about 600 feet wide near Eitaibashi and about 500 feet wide in the upper course near Kototoibashi. Altogether nine bridges are to be thrown across it as part of the reconstruction work, at a total expenditure of Y.16,945,000. The work of constructing these bridges was all on a great scale, and was carried out with exhaustive care as well as remarkable swiftness.

The fullest inquiries and investigations were made in determining their plans and work, and the work which was commenced in 1924 was completed in four years in 1927. The iron and steel and all other materials used in the construction of these bridges were Japanese products. The steel girders employed were all manufactured at home. Those used for the Sumidabashi alone weighed about 20,000 tons. In the construction of the Eitai and the Kiyosu bridges pneumatic caissons were resorted to, they being of a size huge enough to reach the river bottom which is about 100 feet below the surface. They are to-day being employed elsewhere in the construction of bridges.

The bridges built by the Reconstruction Bureau are all strong enough for heavy traffic. In addition to this, the force of earthquakes has been taken fully into consideration in the construction of these bridges. The live loads which should form the basis of their plan consist of the following :—

Uniform line load	...	...	125 lbs/ft.2 (k60-ft.)
			80 lbs/ft.2 (1=300-ft.)
Motor trucks	...	...	15 tons
Road rollers	...	...	15 tons
Electric tramways	...	...	30 tons

As to the earthquake acceleration, it is possessed of one-sixth of the acceleration of gravity in up and down direction and one-third of the acceleration of gravity in horizontal direction.

Tsukiji-Tsukishima Bascule Bridge for Tokyo

An important link in the development of Tokyo Harbor and Market center will be the construction of the first bascule bridge in Japan. The bridge will link the land to be reclaimed around the edge of the harbor with the industrial district and Central Municipal Market at Tsukiji.

The types of vessels which will pass through the bridge require that it be a movable span allowing barges and small craft to pass underneath and the larger freight carriers through the opened section.

The bascule type was finally adopted as most suitable, the plan being similar in general design to the Chicago River bridge connecting Michigan Boulevard with the southern districts of that city.

The Japanese engineers have outlined a system for keeping vehicular and pedestrian traffic moving during the time that the central span of the structure is open for vessels to pass. This takes the form of a tunnel directly beneath this section to be bored through the river bed at a sufficient depth to give the necessary support.

The pneumatic caissons used in sinking the main piers of the center span will be left open down the center. Through the tubes thus provided there will be a series of heavy electric elevators. These connect with the tunnel proper and will transport motor cars, carts and pedestrians to the lower level from where they will pass to the other side through the tunnel and up to the traffic level of the bridge by another series of lifts.

The bridge is designed to open and close over a period of six minutes, which would have to be extended if a large volume of big vessels required passage through at the same time. While the tunnel section with elevators will tend to slow-up traffic and does not provide for continuous movement of tram cars, it will go far to relieve the pressure.

From the beginning of Tokyo as a large city there has been a ferry across this section of the river and plans for a bridge were put forward several times to replace this slow transportation. The present plan was formulated as far back as 1912 when the city of Tokyo appropriated funds for a survey of the site.

Following the earthquake the question of this important bridge became more pressing. The reconstruction plans now provide a main highway 27 meters wide from the center of the city to the mainland approach to the bridge and the market. From this artery, traffic to the island of Tsukishima already amounts to 1,000,000 people a year who are required to use the ferry service.

With this background engineers have designed the bridge to have a total length with approaches of 346 meters. Of this the two steel arch spans on the banks of the river will be 90.8 meters long and the movable center span 36 meters. Effective width for traffic will be 22 meters for tramways, motors, horse carts and pedestrians inclusive. Expenses of building the bridge is estimated at Y.3,500,000.

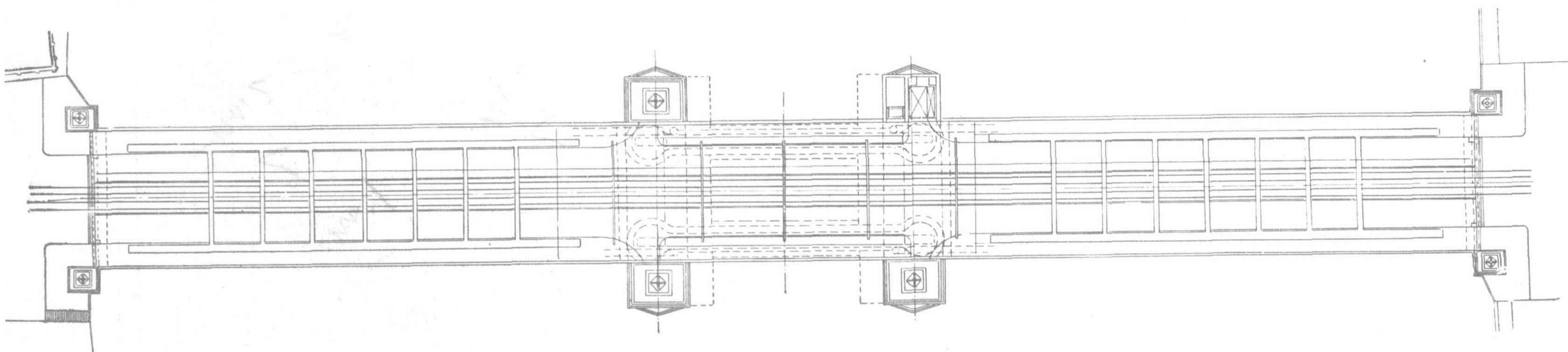
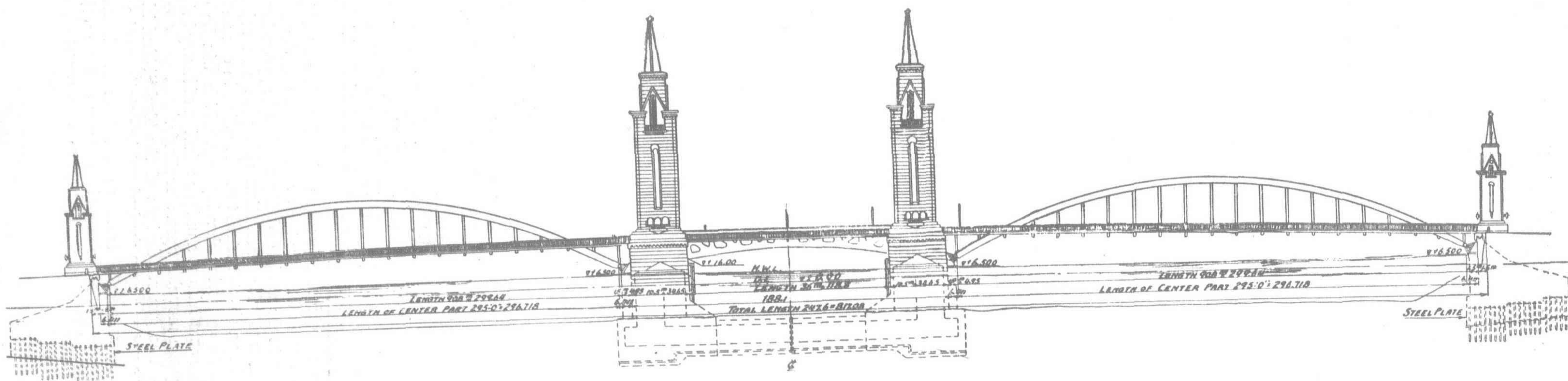
It is estimated that the construction of the bridge will bring actual monetary profit to the city in addition to acting as a public convenience. The present ferry is operated at a cost of Y.150,000 a year, which will be one item of expenditure done away with by the bridge.

The most important source of profit to the city will be in the appreciation of land values on the reclaimed land around the harbor which will be served by the bridge. The city will acquire about 36,000,000 square feet of land in this section through the reclamation project, which it plans to sell for industrial, private market and commercial sites.

A vehicular tunnel under the river at this point was at one time considered but on account of the depth to which it would have to be sunk and the angle of approaches together with the high cost of construction this plan was rejected. The idea of having a short central tunnel section in connection with the bridge is an engineering development which will be closely watched by other countries as a unique solution of heavy bridge traffic problems through movable span structures.

The general designs of the Tsukiji-Tsukishima bridge, which have not yet been worked out in detail, are the work of Mr. Takio, of the Bridge Section, Department of Public Works, of the City of Tokyo. Mr. Ebi is Chief Engineer of the section and Mr. Koike, Assistant Engineer, all of whom have contributed to the work.

Proposed Bascule Bridge Over the Sumida River at Tokyo, Connecting Tsukiji with Tsukishima



Water Turbine Development in Japan

By MASATAKA TAZAWA, Director, Dengyosha Prime Mover Works, Ltd., Tokyo

I.—DEVELOPMENT OF THE WATER TURBINE AS A BASIC PRIME MOVER TO THE INDUSTRY OF JAPAN AND ITS STANDARDIZATION

Japan like all other countries of the world, has, for centuries, utilized the water turbine as a prime mover, the most important motive power device used for industrial purposes. Because of its mechanical simplicity, the water wheel was, virtually, the sole prime mover contrivance in operation in the earlier period, when mechanical science was still in the embryonic stage of development. The remotest corners of any country-side had their water wheels, wherever there was a stream to be harnessed. Unostentatious civil works at vantage points of such streams kept a water wheel in motion, and the power created by it operated all sorts of machinery. Any industry which availed itself of this device expanded its scope in keeping with the progress of civilization, but the most universal application of the water wheel is to be found in the hulling of rice, the most important of all staple foods used by the Japanese race. Next in importance comes raw silk reeling as the utilizer of water wheels, the silk industry being the most world renowned of Japan's industrial activities. In almost every factory and home in rural communities, where streams abound flowing over any territory with proper inclination, the water wheel was the most popular of all motive power devices.

A little later, as new industries were born, in keeping with the progress of the times, the ever expanding numbers of manufacturing, building and agricultural activities adopted hydro wheels as their prime movers. Among these the principal industries were flour milling, paper making, lumber working, irrigation and drainage. The water wheel in evidence in those days, was made entirely of wood, the axle even was of wood—of the zelkova tree—and its manufacture was entrusted to a specialist, known as the water wheel builder, who built his water wheels according to a formula which was characteristic of the age in which he lived. A close inspection of these water wheels discloses the fact that these carpenters of the earlier periods were turning out their wheels by the principle of standardization as it were. Of course these wheelwrights had no access to text-books or references which could impart complete scientific knowledge whereon to base their construction.

Because of the fact that they were the product of ingenious water wheel builders, mainly guided by long experience in that line, wheels in different localities reveal a diversity in size and type, which is peculiar to each. If we conducted a research and investigation of these wheels archaeologically, making use of the information we now have at our command, much light would be shed on the manner in which this standardization in wheel building was effected in these early eras. The adoption of modern machinery and equipment resulted in the discarding of these primitive water wheels so that water wheel building is now a lost art, as well as the method of their construction, which was jealously guarded as a trade secret, and which was imparted to a worthy disciple only verbally and which is no longer available to supply to posterity the data for the scientific study of this interesting subject. As it is, they are recorded as belonging to a stage in the history and evolution of hydraulic turbines.

During the days when wooden water wheels were universally employed, the majority of them had an output of two to three horsepower or less, and even the most powerful wheel was no larger than approximately ten horsepower, which, it seems, took ample care of the power requirements of the industry of those days. In the meantime, the reaction turbine and Pelton wheel were invented and developed in the West, and their importation into Japan sealed the doom of the wooden wheel, which, as has been said, is now reduced to the status of an antique, good only for inspiring poetic sentiment. The scope of the industrial enterprises has since expanded, and large scale manufacturing plants are springing up in all important hydro territories, putting many former isolated communities definitely on the industrial map overnight, as it were.

II.—INVENTION OF THE WATER TURBINE, EXPANSION OF THE INDUSTRIAL SCALE AND INDUSTRIAL DECENTRALIZATION

Just when the so-called European style water turbine made its appearance for the first time in this country, is not clear, but the fact seems well established that a number of weaving mills in Okazaki in Aichi Prefecture, Kofu in Yamanashi Prefecture and Kiryu in Gumma Prefecture, were pioneers in this field, by installing these wheels



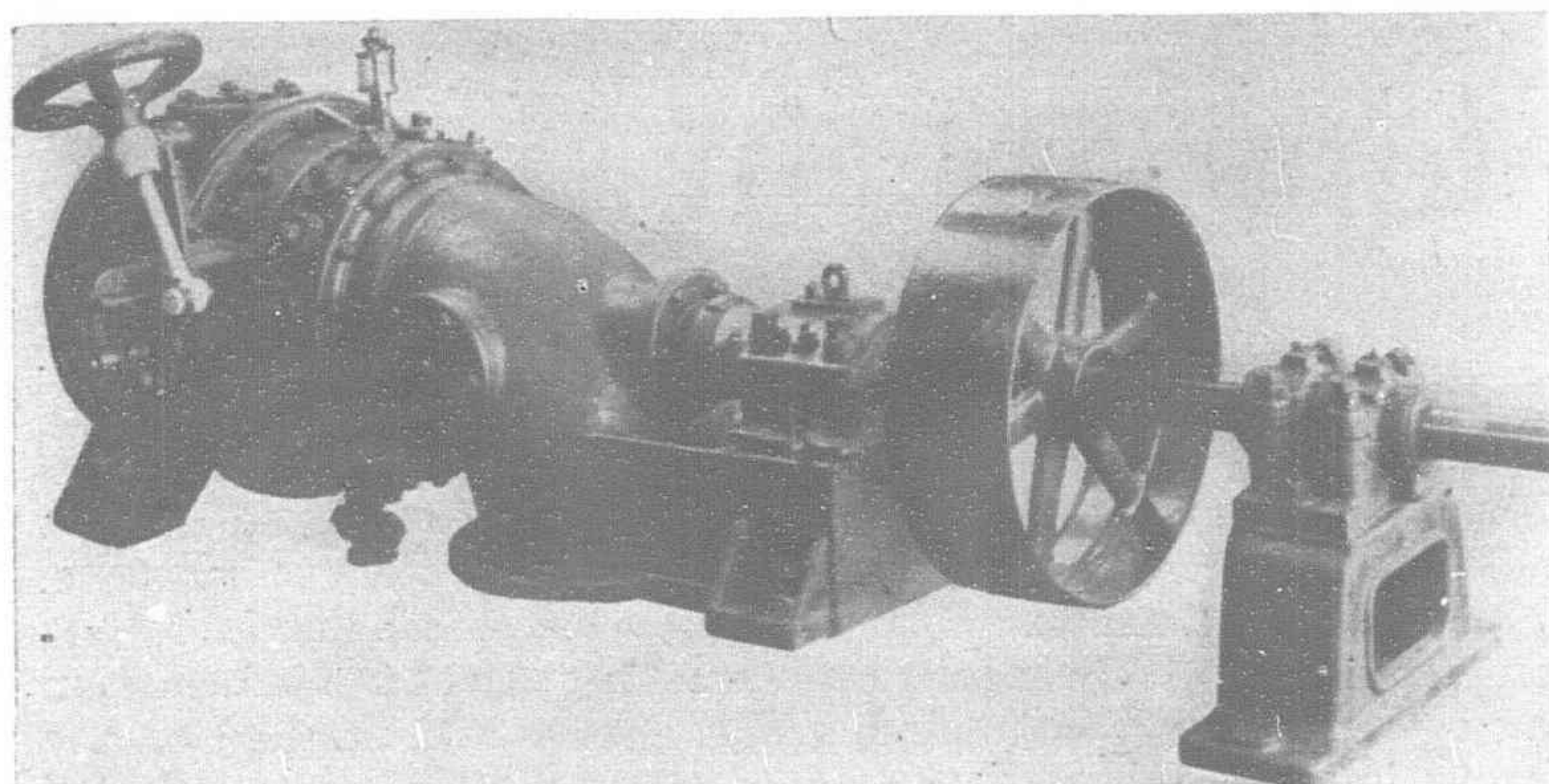
The Oldest Type Prime Mover Water-wheel of Wooden Construction



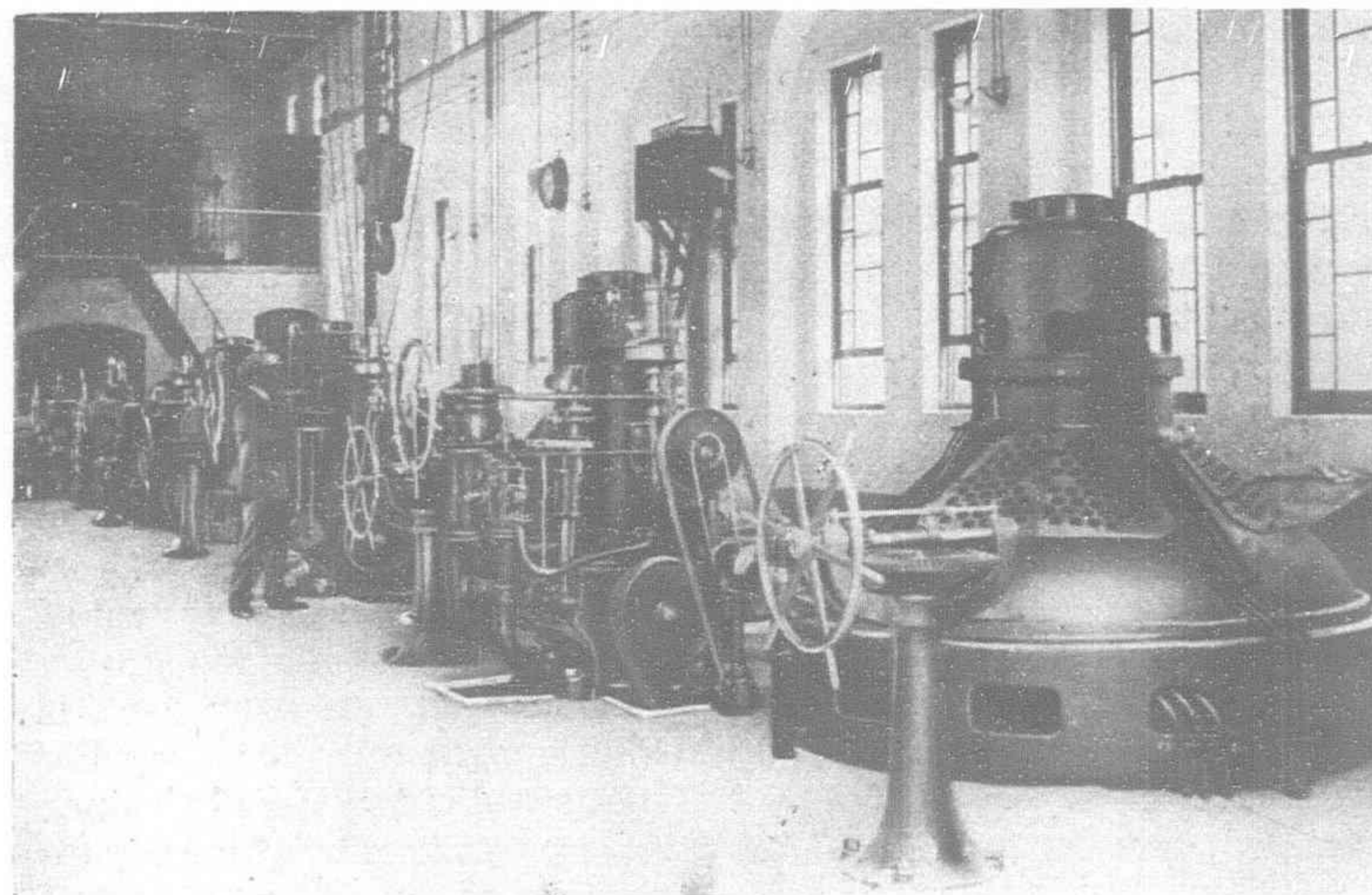
Typical Power Station Operated by Japanese Turbine in the Transitory Period (1914)



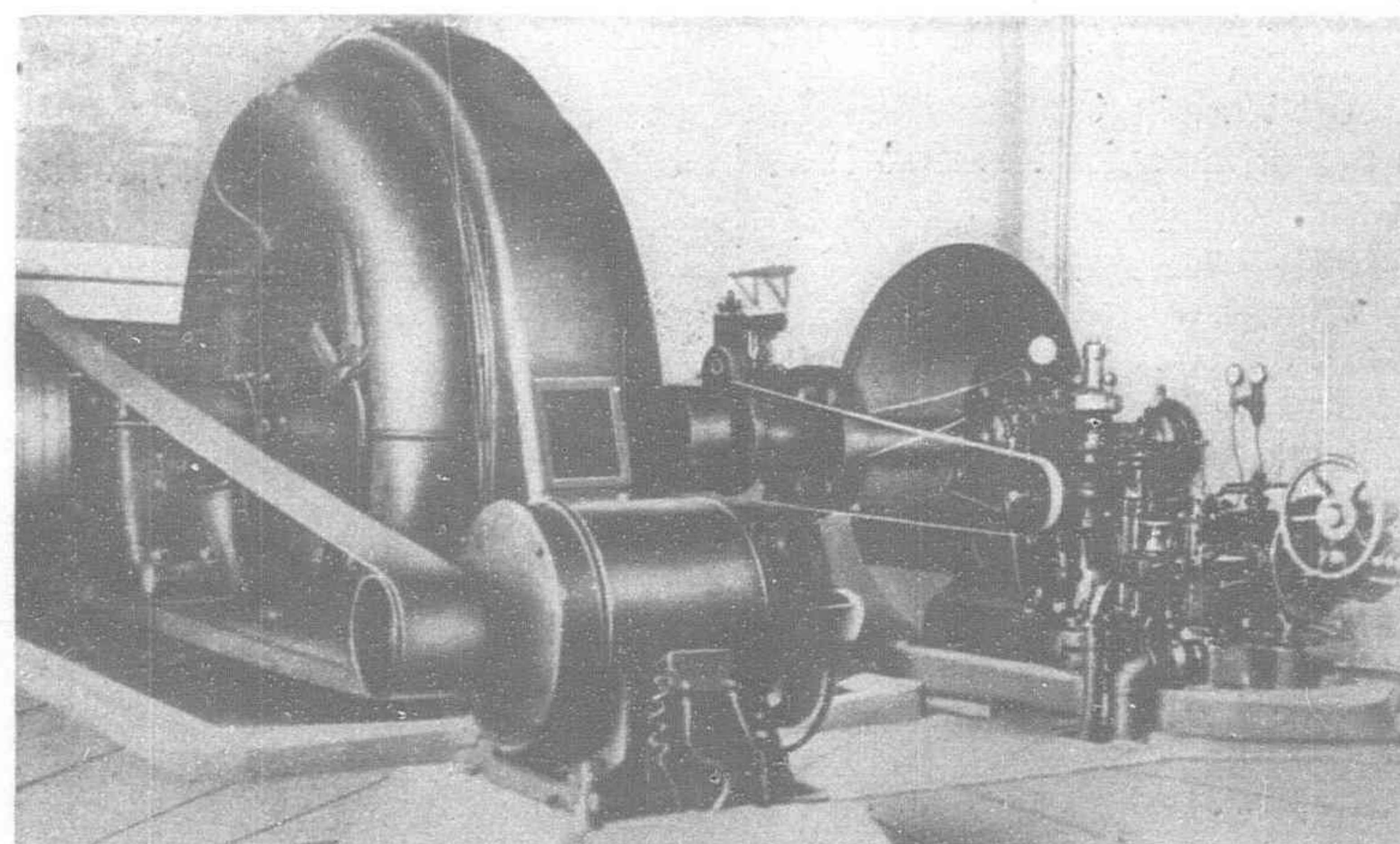
Small 20 H.P. Power Station Operated by Japanese Manufactured Water Turbine of Early Days (September, 1913)



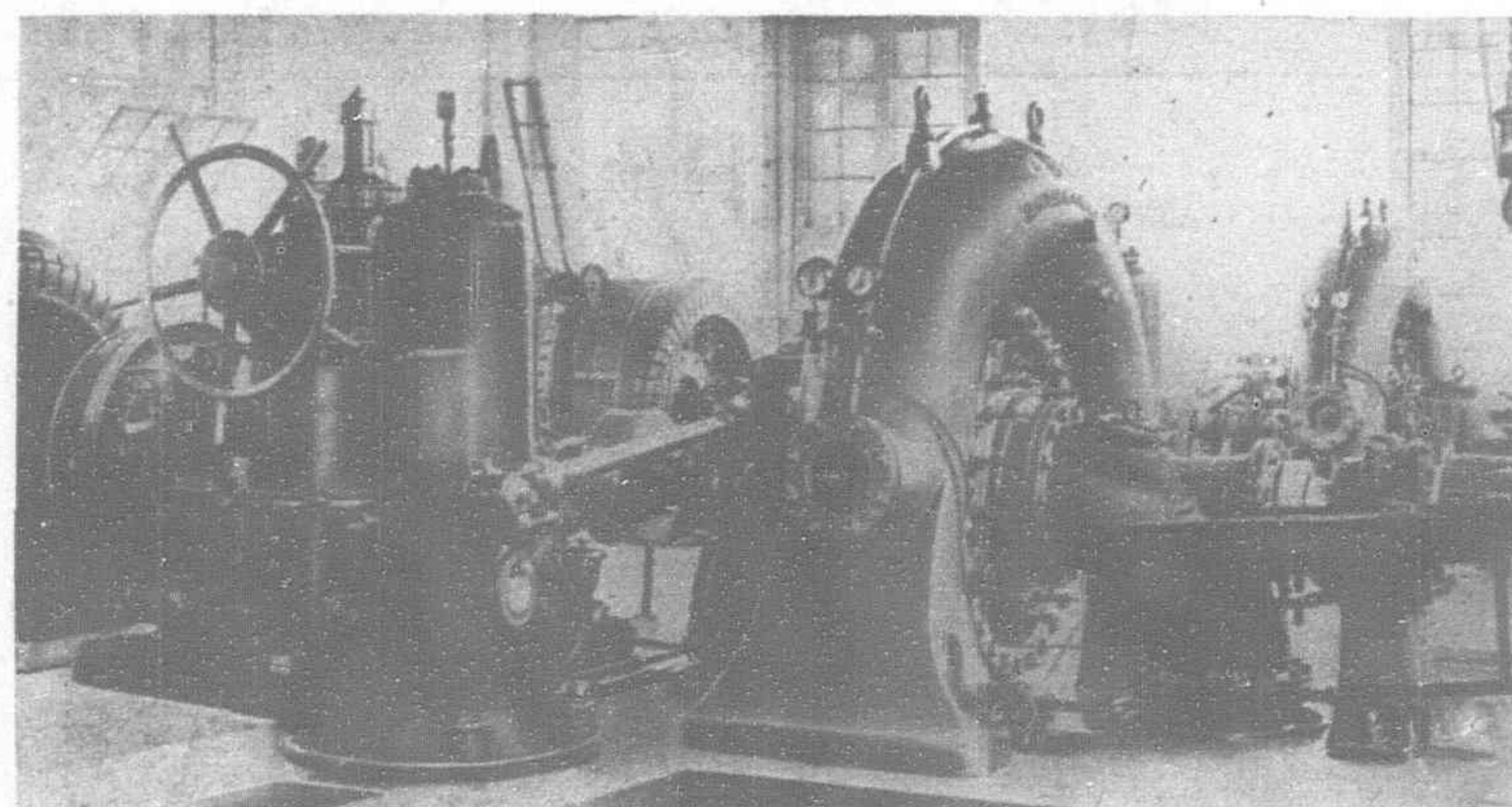
A Specimen of Early Period Water Turbines Turned Out by Japanese Manufacturing Plants, (About 1912)



The Interior View of the "Made in Japan" Power Station of the Ibigawa Electric Power Company, (Installed March, 1915) Head 250 Feet. 1,800 H.P.

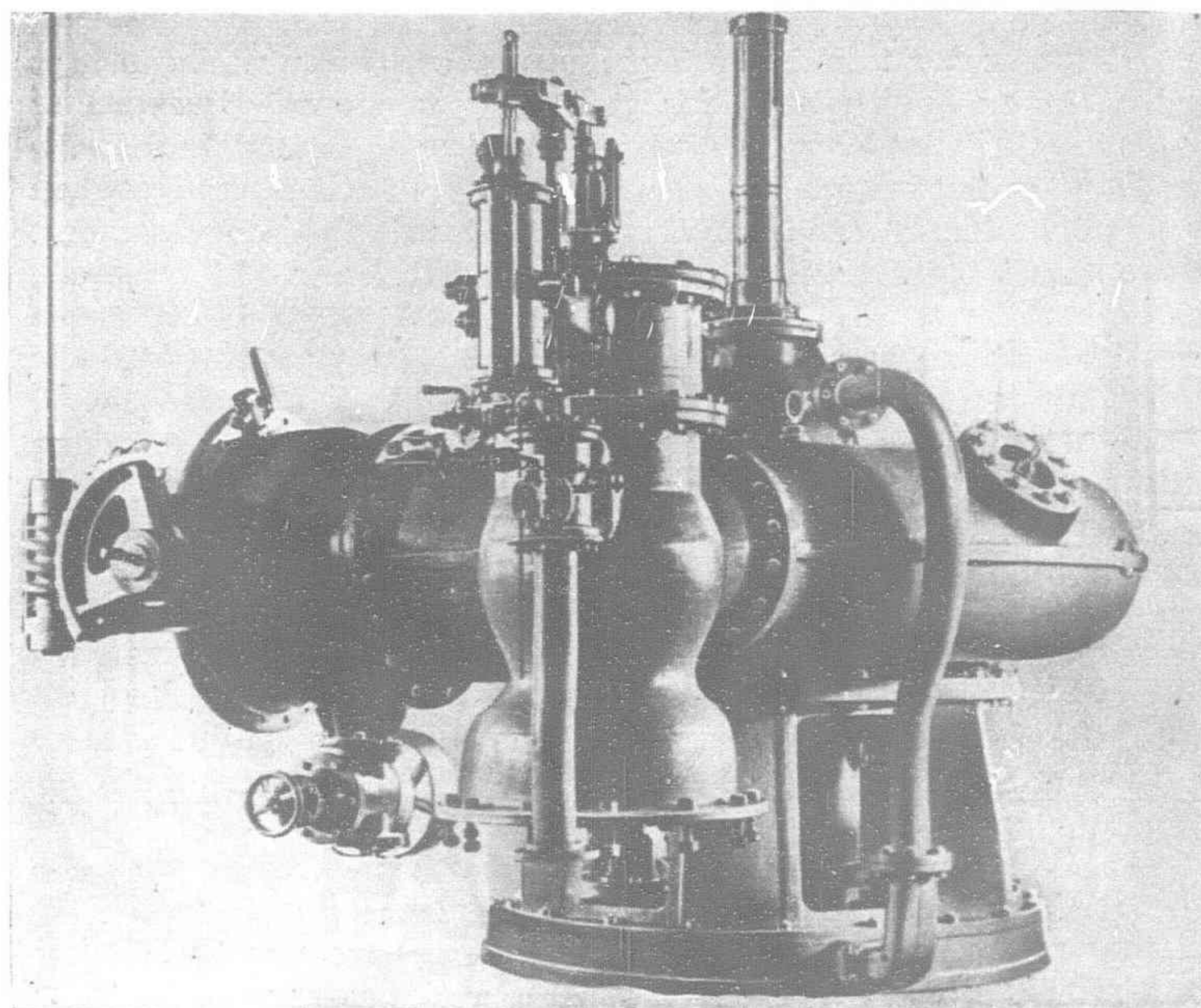


The Interior View of the "Made in Japan" Power Station of the Fuji Paper Manufacturing Company on the River Sorachi. (Installed October, 1917) Head 65 Feet. 3,850 H.P.

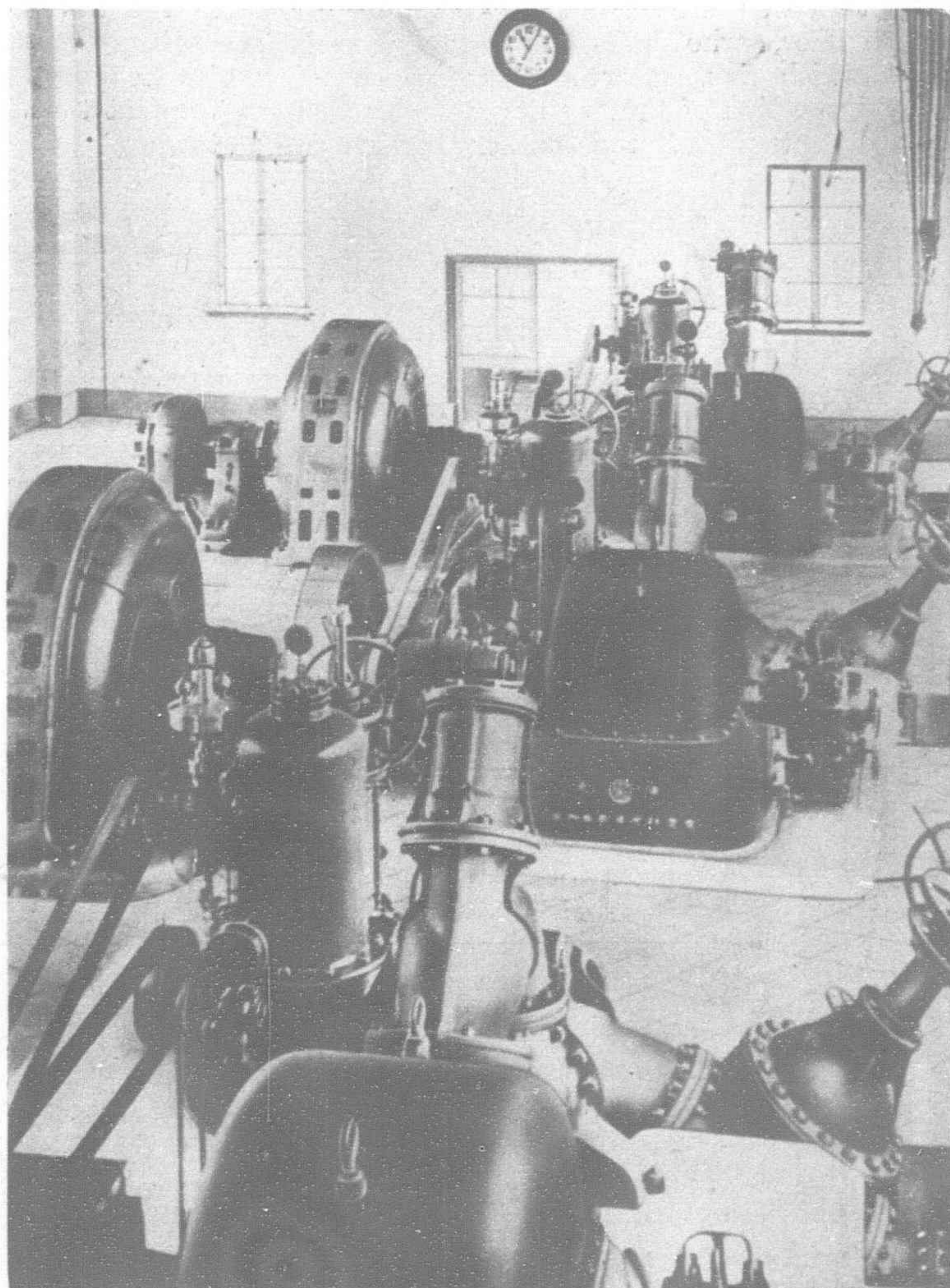


The Interior View of the "Made in Japan" Power Station of the Kyushu Hydro-Electric Company, (Installed March, 1919) Head 291 Feet. 4,250 H.P.

TYPICAL WATER TURBINE INSTALLATIONS IN JAPAN OF JAPANESE MANUFACTURE



The "Made in Japan" Water Turbine in Installation at the Power-Station of the Ibigawa Electric Power Company



The Interior of the Power Station of Mt. Hakone Scenic Railway

of Occidental invention as early as about 1882. At this late date there is no record available to throw any light on the exact types and horsepower capacity of these water wheels, or to furnish a basis for appraising their contribution toward the development of industry.

When the cotton spinning industry began to secure a firm foothold in Japan, toward the closing years of the nineteenth century, the water turbine showed its maximum use as the motive power machinery for this industry. In 1896, the Fuji Cotton Spinning Company erected a large scale spinning mill in the Hakone mountains, where hydro resources are exceedingly rich and the big consuming center of Tokyo not far distant. At that time electric power transmission was unknown, and the company operated its machinery by transmitting power from a reaction turbine of the then most efficient type, by means of a rope pulley and cotton rope. The mill in those days was a model spinning factory, with the most modern machinery and equipment, being the forerunner of the present Fuji Gas Spinning Company, one of the top-notch firms of the cotton manufacturing industry to-day.* When electric power transmission was invented, the above installation was quickly discarded and electric motors to drive the machinery and equipment were installed in its place.

During the five years ending in 1898, the Oji Paper Manufacturing Company constructed two large power plants at Nakabe and Keta in Shizuoka Prefecture, from which to derive energy for driving its mammoth paper making mills. The Nakabe power plant had several sets of open flume reaction turbines of American make, with which to tap a head of 27 feet, generating enough power to run the whole paper mill. The Keta power house had a Pelton wheel worked by a stream with a head of 77 feet. The Fuji Paper Manufacturing Company, a rival concern of Oji, in 1897 erected at the foot of Mount Fuji, a power plant equipped with several sets of iron case turbines of 600 horsepower, working a head of 53 feet at Omiya, to supply energy to its paper manufacturing mills. These concerns were the pioneers in the large scale industries which depended on hydro prime movers for driving energy.

With the exception of the plants which derived their motive power from steam engines, such an industry as paper making, in which an abundant water supply is an essential factor, naturally required a factory site in a locality where hydro resources were abundant, in order that they also could harness the water supply as motive power for its paper manufacturing machinery. This necessity accounts for many large scale paper mills being located in the mountain districts, far removed from large cities or towns. One essential consideration influencing the Fuji Spinning Company in locating its mill at Oyama in the Hakone hills, which was the last place the general public, at that time, would associate with such a modern institution as a spinning mill, was the hydro power resources available there, and from which the company management expected to obtain motive energy for paper mill operation. The Fuji Spinning Company's example was followed by similar undertakings, but of lesser importance, at widely separated spots. Because of gradually acquired knowledge these early water turbines, which held sway as direct moving machinery, were relegated to the scrap-heap.

When people discovered how to obtain electricity from hydro power and how to use it as motive energy for driving machinery, it so revolutionized industry as to automatically increase its own development. Up to this time, many manufacturing plants had to be located in inaccessible spots, simply because hydro power resources were available there in the needed volume; but such procedure necessarily entailed a considerable economic loss involved in the transportation of raw materials, finished goods and provisions for operatives and other countless inconveniences. In those days, however, such a bold industrial venture was looked upon with wondering eyes. With the arrival of water power electricity, the locating of manufacturing mills near the source of water power was no longer necessary. Plants are now being erected at points where manufacturing can be carried on most logically and economically after being studied from all angles.

To cite a case in point, the above mentioned Oji Paper Manufacturing Company, some time ago, erected its mill at Tomakomai, Hokkaido, a seaside spot, commanding the best facilities of communication for the benefit of the company and, where good living condition for its employes were assured. The mill has its power generating station far inland from whence, however, current is carried by means of a long distance transmission system, for running

the paper making machinery at the seaside. The Oji Company has since abandoned its plants at Nakabe and Keta, and the glorious days of their supremacy, as the best equipped of the country's manufacturing establishments, are now past. The Fuji Spinning Company's Hakone mills have since developed all the water resources at their command for generating electricity, the distribution of which now constitutes the most important source of revenue of the company.

III.—ADVENT OF THE HYDRO-ELECTRIC PLANT AND HEAD LIMITATION FOR REACTION TURBINE IN THE FORMATIVE PERIOD

The history of the contribution of the water turbine to Japan's industrial activities is roughly outlined in the above chapter, which the writer believes coincides with that of Europe and America. Since that time the industrial development in Japan has been greatly stimulated and increased by the perfection of the electric generator which is driven by the water turbine. Power development units on this principle were first installed in 1890 in the Nikko hills, which are celebrated because of the Tokugawa Mausoleum there, by the Shimotsuke Hemp Spinning Company and the Ashio Copper Mining Property, for supplying their own manufacturing plants with motive energy. Two years later, Dr. Tanabe built a hydro-electric plant in Kyoto as a subsidiary enterprise to the drainage work of Lake Biwa. These were the pioneer units of water power electric stations to be inaugurated in Japan on a large scale central station basis.

According to Dr. Tanabe, he started the necessary survey for this development work as early as 1889. Around that time, he states, he made a trip to America, where he was told by such an eminent authority as Dr. Francis and others that to derive the maximum efficiency from a reaction turbine from a head of 100 feet, it must be divided into four heads of 25 feet each, while if a Pelton wheel is used no such procedure is necessary, resulting in a 50 per cent. saving in the construction cost of the plant and equipment involved. Therefore the latter type of wheel was selected for the Kyoto project. Looking back from this day and age, to the fact that a head of 100 feet had to be divided into four heads of 25 feet each, for driving a reaction turbine to develop barely 100 horsepower, is certainly interesting. One cannot help feeling that we are now in another world when we stop to consider that we have accomplished so much in the electrical field that one reaction turbine can now be successfully used for a head of 1,000 feet. To think that this much progress has been made in the brief period of 40 years! The Pelton wheel, which Dr. Tanabe finally adopted, was a 120 horsepower unit for a head of 100 feet, having a mechanical governor for speed regulation, and driving the generator by a counter shaft. In those days this mechanism was a marvel of science and engineering skill to our people.

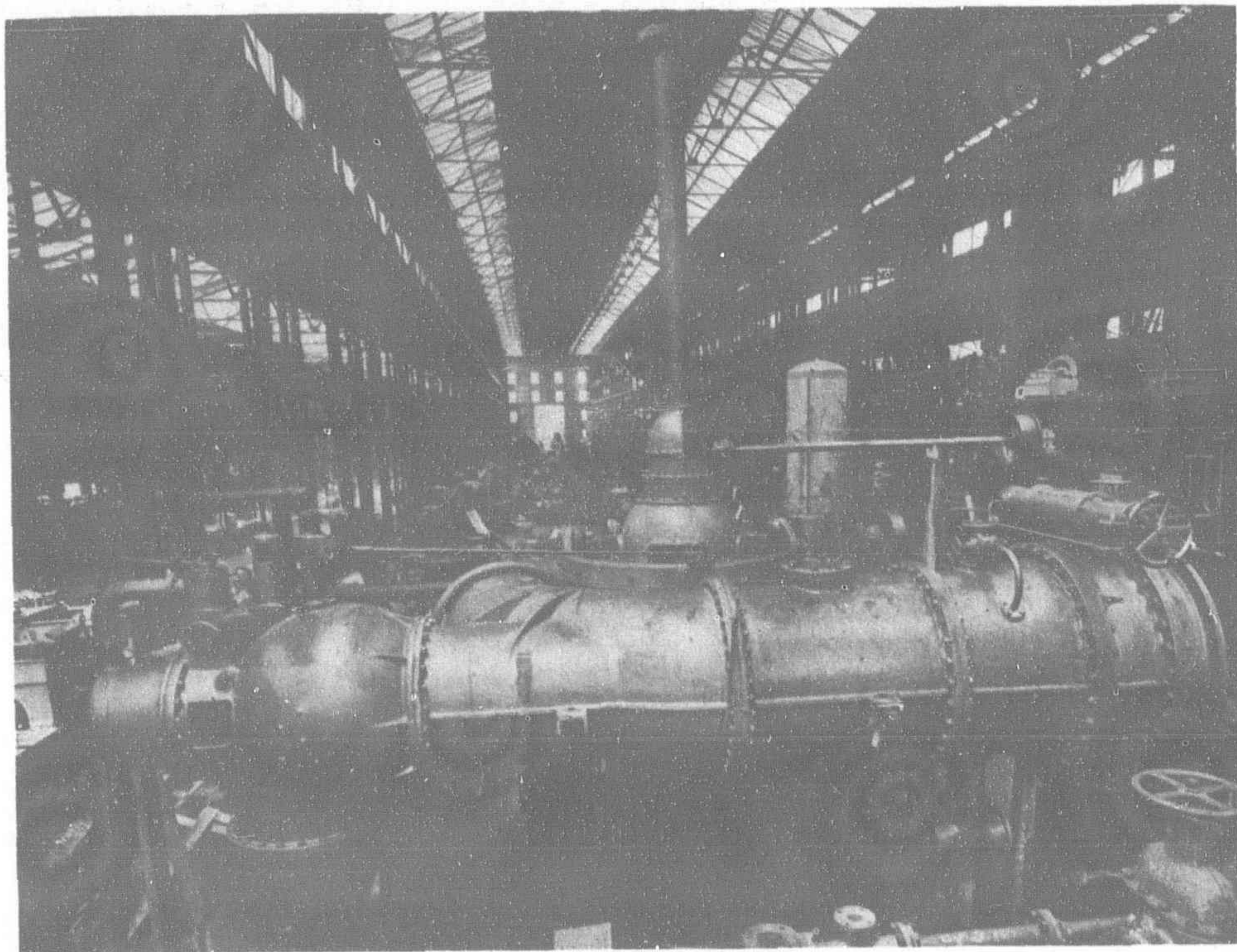
These hydraulic prime movers, which were introduced by the pioneers in the water power electricity field, and these reaction turbines, not only enabled the paper making and cotton spinning industries to expand their operations, and not only stimulated the growth of Japan's industry in all its branches, but, also, imparted to our manufacturers practical knowledge of these various types of equipment. During the five years ending in 1897, several large machinery factories, had launched the manufacture of these power units, modelled after European and American originals. While the number of these was negligible, indeed, the high standard of workmanship displayed was truly worthy of the clever engineers and skilled workmen responsible for them.

IV.—THE EARLY HYDRO-ELECTRIC PRIME MOVER AND AMERICAN MANUFACTURED TURBINES

The evolution of water turbine construction has kept pace with electric generator manufacturing, as the two are inseparably interdependent. The successful development of the hydro-plant of the Kyoto drainage enterprise opened the eyes of enterprising business men of this country to the industrial opportunity inherent in this newly introduced line of activity. About 1897 hydro-electric projects were springing up in all parts of Japan, which naturally created a large demand for water turbines, the American manufactured ones being most popular. The choice of American machines is not to be wondered at in view of the fact that America was the cradle of hydro-electricity activities, and machinery importers

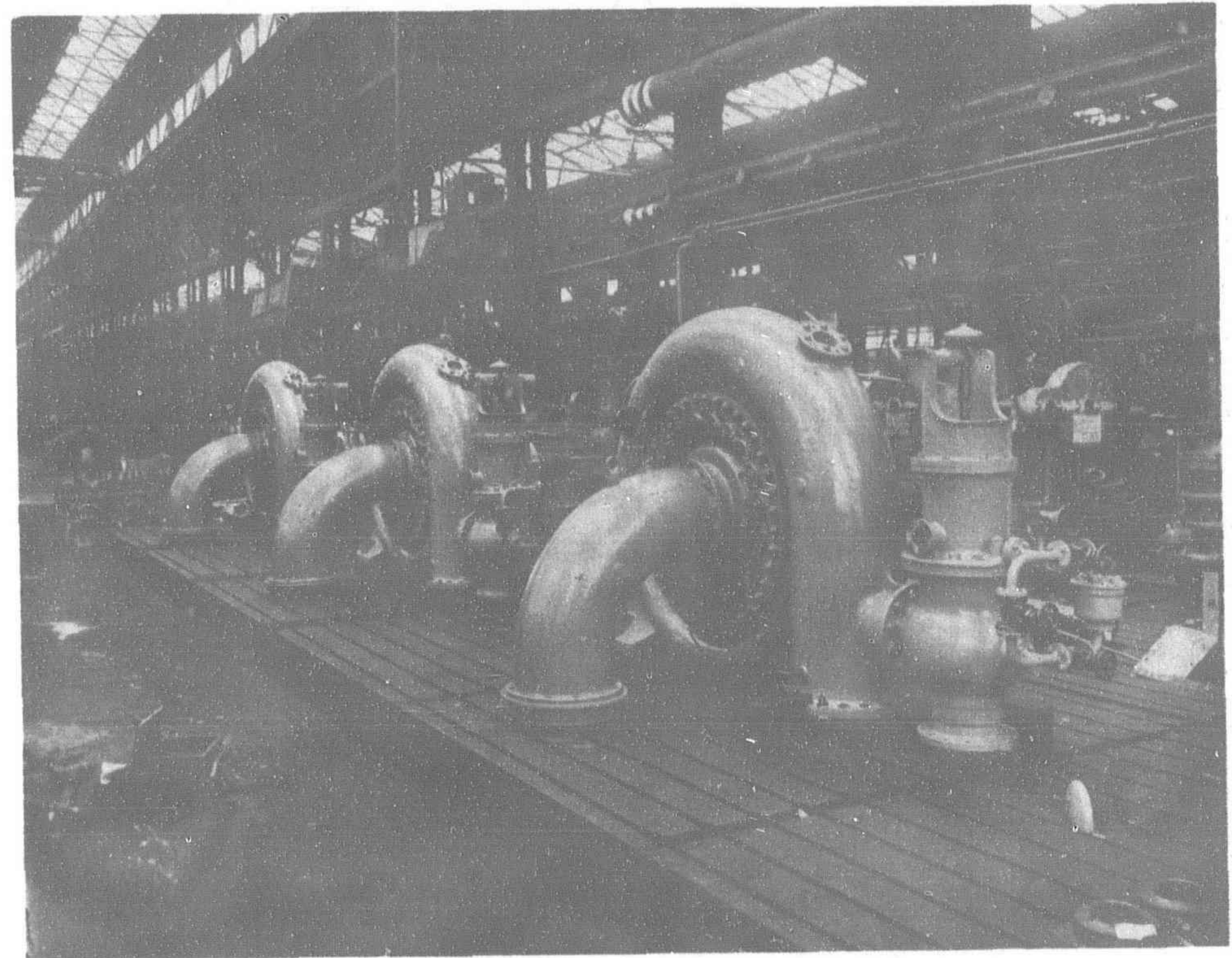
*Manufacturing a cotton material given a glossy surface by gas application.

Water Turbines Built at the Kobe Works of the Mitsubishi Zosen Kaisha



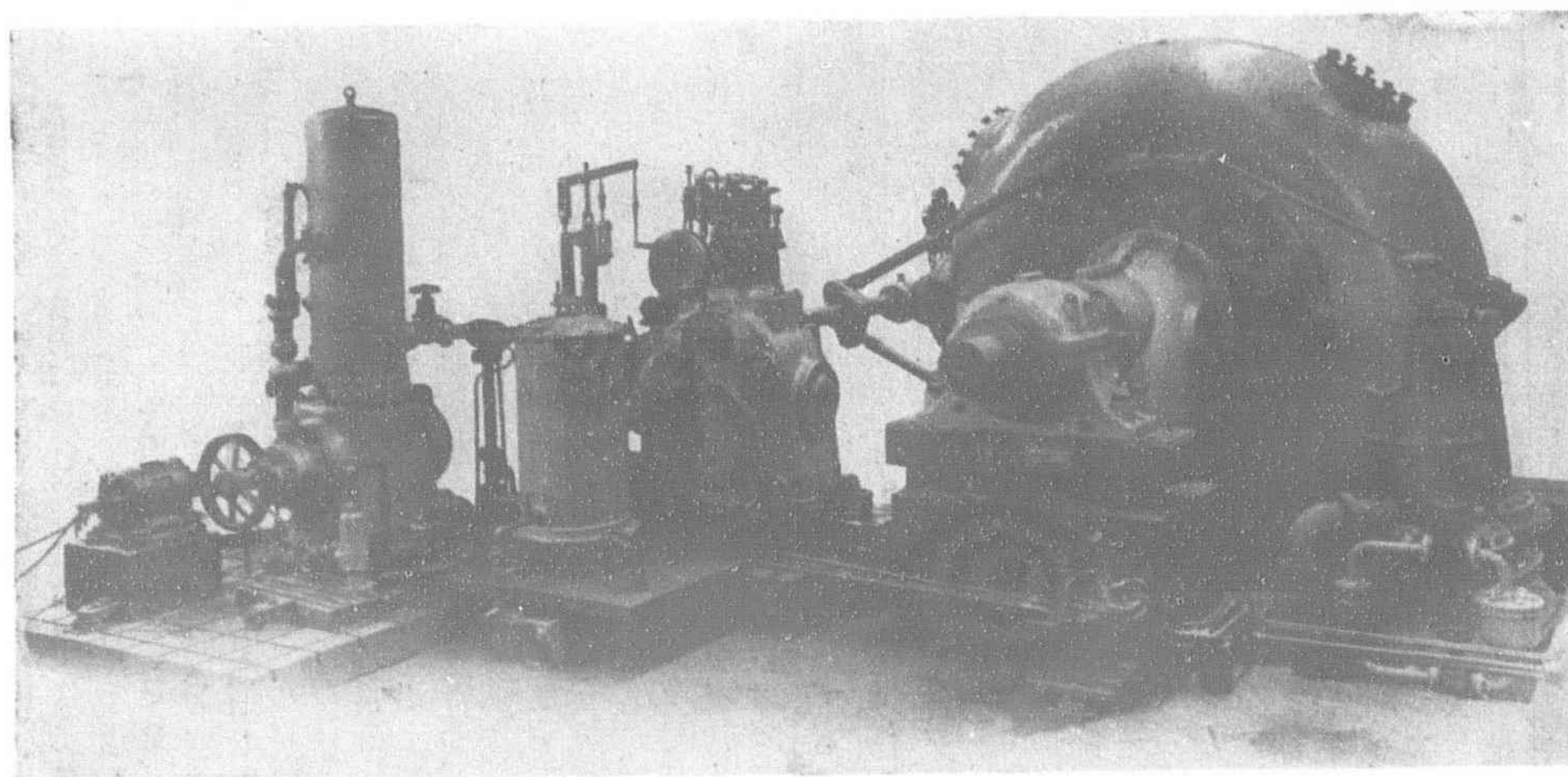
Mitsubishi Francis Water Turbine

Vertical shaft, single spiral, single discharge Francis Water Turbine.
Effective head, 35 meters—Max. output, 3,550 H.P.—Normal speed, 375 r.p.m.



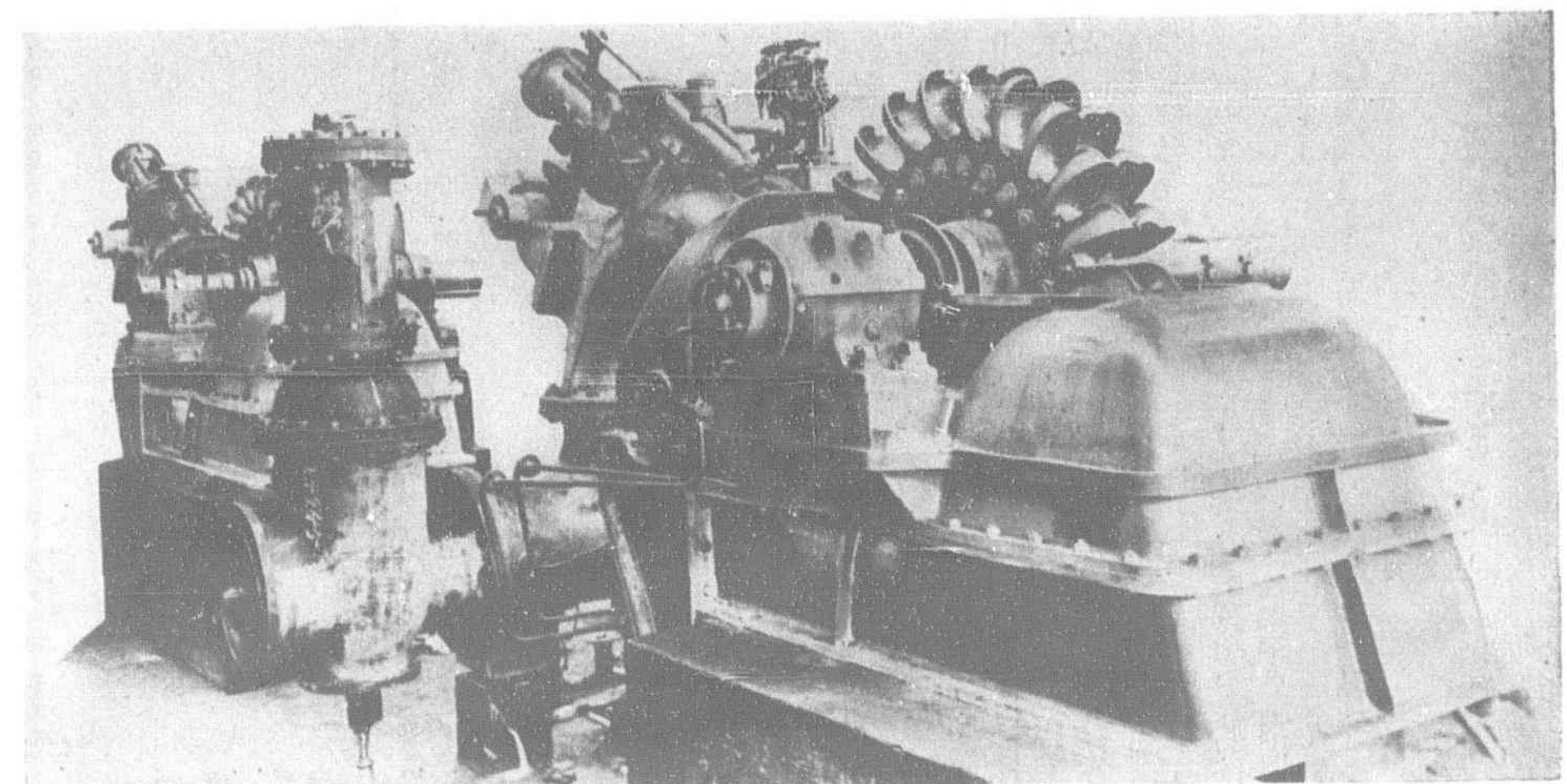
Mitsubishi Francis Type Water Turbine

Three sets—Horizontal shaft, single spiral, single discharge Francis Water Turbine.
Effective head, 165.5 meters—Max. output, 3,100 H.P. (per set)—Normal speed, 730 r.p.m.



Mitsubishi Water Turbine

Horizontal shaft, single spiral, double discharge Francis type Water Turbine with automatic equipment.
Effective head, 105 meters—Max. output, 4,500 H.P.—Normal speed, 600 r.p.m.



Mitsubishi Pelton Type Water Turbine

Two sets—Horizontal shaft, single wheel, two nozzle Pelton type Water Turbines.
Effective head, 243 meters—Max. output, 2,220 H.P. (per set)—Normal speed, 600 r.p.m.

were equal to the situation by creating substantial business for American manufacturing concerns. Typical of these early importations were the Leffel and MacCormick in reaction turbines, and the Pelton wheel as an impulse wheel for the purpose of generating electricity.

To those who were used to the neat and machine-like appearance of the steam engine, these water turbines by no means gave a favorable impression, because of a rather crude construction and irregular shape, which were not associated with machinery. These suggested more properly heavy pieces of civil engineering equipment rather than prime movers for electric generator. Conveniences for speed regulation were most inadequately provided for when compared with steam engines, and were such as to engender little confidence in their ability to take care of load fluctuation. The result was that a constant attendance and a rigid oversight was necessary in order that the machinery would function faultlessly. On the other hand, machinery manufacturers in Japan by training were very poorly equipped, and there were no dependable books of reference expounding the theory and practice of such a contrivance from which to improve the imported wheels to the degree of perfection of the steam engine. So the result was that these wheels were used as they were furnished by American manufacturers from 1897 up to 1901.

In the meantime, however, mechanical governors of many descriptions, of which the Woodward mechanical governor was outstanding in construction and performance, were brought to our attention and occasioned surprise to us all. When a low head open flume turbine was equipped with this governor, this combination was considered the last word in water turbine regulation, and as such was the object of study by college professors. Very soon the Lombard oil pressure governor was perfected in America. It was the best known of many governors then existing and functioned with uncanny efficiency in regulation work of the most delicate nature. The number of new hydro-electric plants in the country was multiplying every year, and their machinery and equipment needs were almost exclusively taken care of by American manufacturers, whose perfect control of this market lasted unbroken for some time.

V.—IMPORTATION OF EUROPEAN WHEELS DURING THE EARLY PERIOD AND GROWTH OF HOME SUPPLY IN JAPAN

About 1902 water wheels of European manufacture began to invade this country. These machines were of such construction and appearance as to compare favorably even with steam engines, and they impressed the hydro-electric industry of Japan very favorably. These units were from the plants of Escher Wyss, famous Swiss manufacturers of water wheels, a horizontal Francis spiral turbine, equipped with a water pressure governor, and a splendid machine in every respect. The German manufacturing firm of J. M. Voith proved to be the chief rival of the Swiss maker by sending its equally well designed Francis turbines, fitted with a mechanical governor of exquisite workmanship. The Pelton wheels also made wonderful strides, in that they were made suitable for high heads for which Professor Doble's discovery was solely responsible.

Electric power transmission received its share of attention, its progress being in keeping with other departments of the electrical industry. The rope transmission for electric motors, the most awkward and dangerous for the purpose, was scrapped, and electricity was then made to illuminate and drive pumping arrangements in mining galleries. On the whole, the increasing use of electricity changed the complexion of industrial management. Hydro-electricity began to claim increased attention in the educational field, and a chair was established in Kyoto University in charge of a competent professor specializing in this particular branch of science, to diffuse and spread useful knowledge concerning its various phases. Japanese manufacturers were not behind in absorbing the necessary information, and their exhaustive and painstaking study of all kinds of machinery, which flooded the market from all advanced countries of Europe and from America, soon resulted in 1902 in their launching the production of water turbines of their own design and construction, which are not imitations of European or American models. Quite a number of water power electric companies, which were springing up, were entirely dependent for their machinery and equipment on home manufacturers.

Looking back on those days, one fact strikes quite forcibly the minds of many and that is the fact that during the formative period

of the Japanese hydro-electric industry, from 1897 to 1901-02, the American water turbines were pre-eminent, as practically all the hydro plants started their careers with American designed and American manufactured units. Since about 1899-1900, the lectures on hydro-electricity by Dr. Göriz of Germany created a great following on the European Continent, which contributed much to the spread of hydro-electrical knowledge there. The result was that European manufacturers were turning out hydro turbines of a high order of manufacturing skill which fulfilled the most exacting needs of the hydro industry. These units were a departure in their construction, as viewed from the standpoint of wheel manufacturing technique and from thenceforward became a full-fledged machine-like product emerging from the former stage of crude construction and appearance.

VI.—WHY AMERICAN TURBINES WERE DISPLACED BY EUROPEAN RIVALS IN JAPANESE MARKETS

The partiality of American manufacturers for their own standardization seems to have been mainly accountable for the inroads of European competitors, resulting in the former's ultimate eclipse in the Japanese market. The American makers of water turbines, as a rule, failed to take note of the many characteristics of hydro sites for which individual turbines ought to be built. To take care of these varying needs, American bids to qualify their products chiefly consisted in regulating the size of equipment according to the head and the volume, and nothing was done to change the design of their construction. Almost the opposite was the case with European wheels in that they were specially designed and constructed to suit the particular requirement of the hydro side for which the machinery was ordered. The head of the flow, and other necessary data of the hydro site, for which the unit was intended, were carefully taken note of by European manufacturers in order that their construction might be made proof against any faulty operation.

As a matter of fact, manufacturers of hydro machinery and buyers at that time were not so well advanced in technical knowledge as to be able to appreciate the value of European units and to announce it to the world. Nevertheless, the intrinsic merit of these European turbines triumphed over American rivals, in fact, so much so, that about 1902, turbines from Germany and Switzerland swept over the Japanese hydro machinery market to the detriment of American water wheels, which, for a time, were no longer used. The failure of the American wheels at this stage, was entirely traceable to the American makers policy of standardization so incompatible with the efficiency and other technical considerations required of a hydro wheel for the peculiarities of this country. That the American manufacturers later realized this fact was admitted in a publication of an American turbine concern.

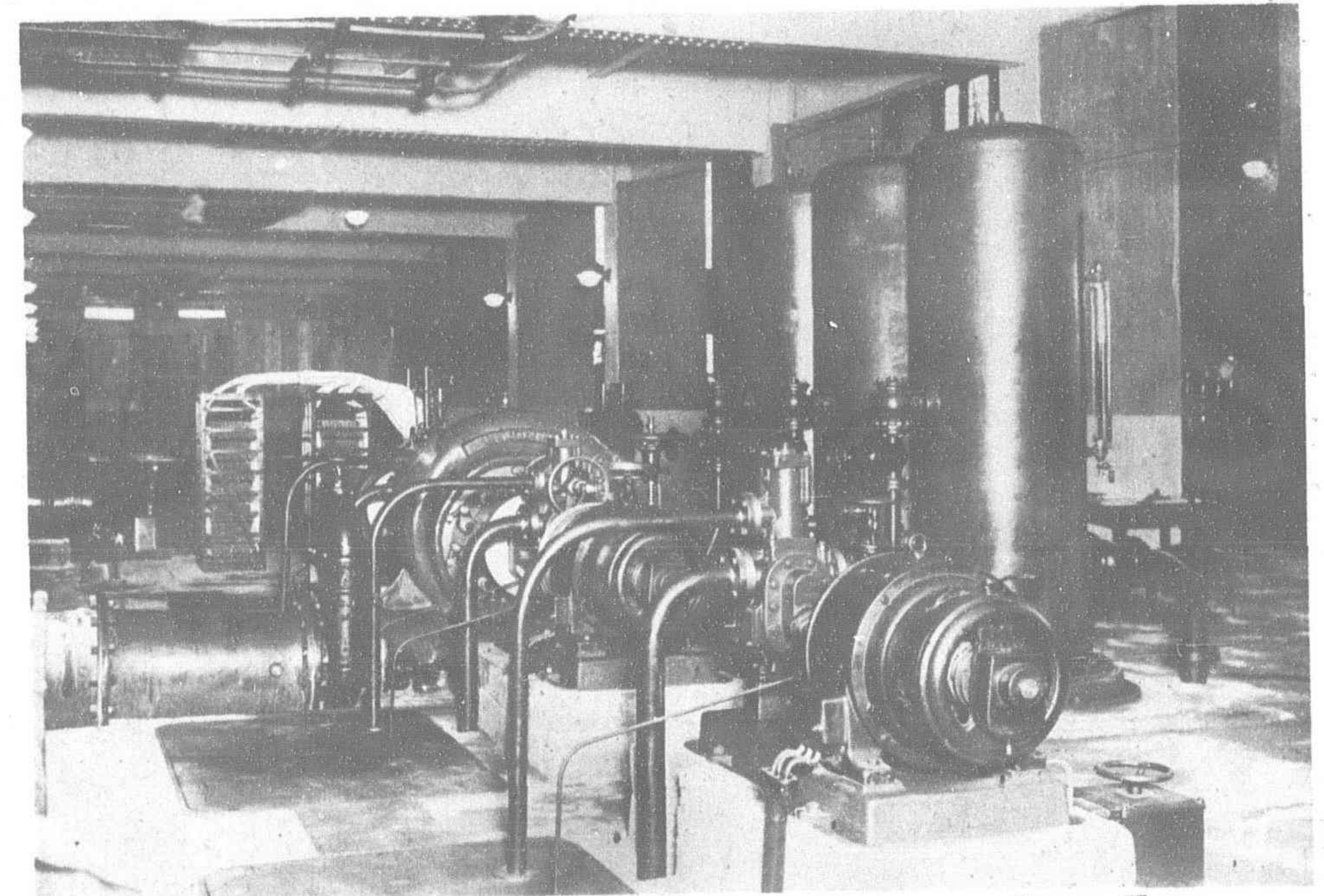
What is required of a hydro wheel varies according to the general layout of the hills and valleys, where the site is located, the stream, the volume, etc. Any effort to standardize such machinery to a certain definite set of specifications, without taking into consideration these site conditions, is liable to disappointment, as it fails to function at a particular speed and thus hampers its efficiency. On the other hand, the policy of European manufactures of designing and building their turbines in faithful accord with the essential data of the particular needs, such as the head, volume and speed of projected power enterprise, successfully filled the customer's requirements. Nevertheless, as the consumer gained more knowledge about the machinery, his requirements for new wheels increased in scope and since information as to the execution of the machinery was not always sufficient, there were numerous cases where the deliveries failed to function properly. This was a source of much anxiety to manufacturers and a financial loss to all concerned.

From 1903 the number of hydro-electric development concerns multiplied, and their turbine needs were met by European units, particularly by German and Swiss makes in ever growing numbers amounting to a virtual control of the market. The amount of home-produced machinery was almost negligible. American-made wheels were almost completely driven out of the Japanese market by this time. The reputation of the American makes was further damaged by the unfortunate explosion which took place in one of the American turbine sets installed along the river Kiso, which claimed the life of one of the government inspectors present at that time. Other units also started to crack in practically the same identical part under the heavy pressure and this cast

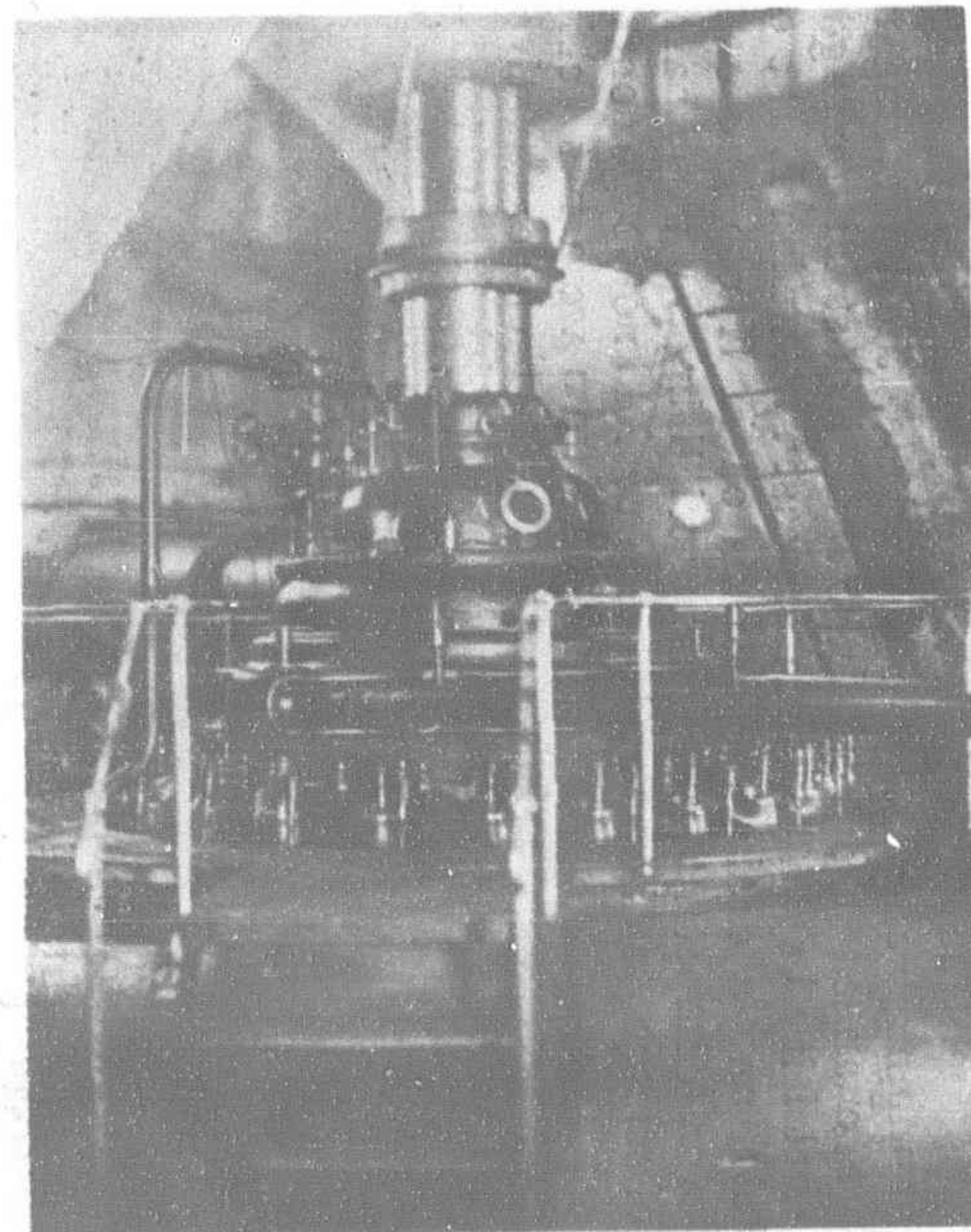
A TYPICAL ESCHER WYSS INSTALLATION IN JAPAN The Nippon Electric Power Company's Yanagawara Power Station



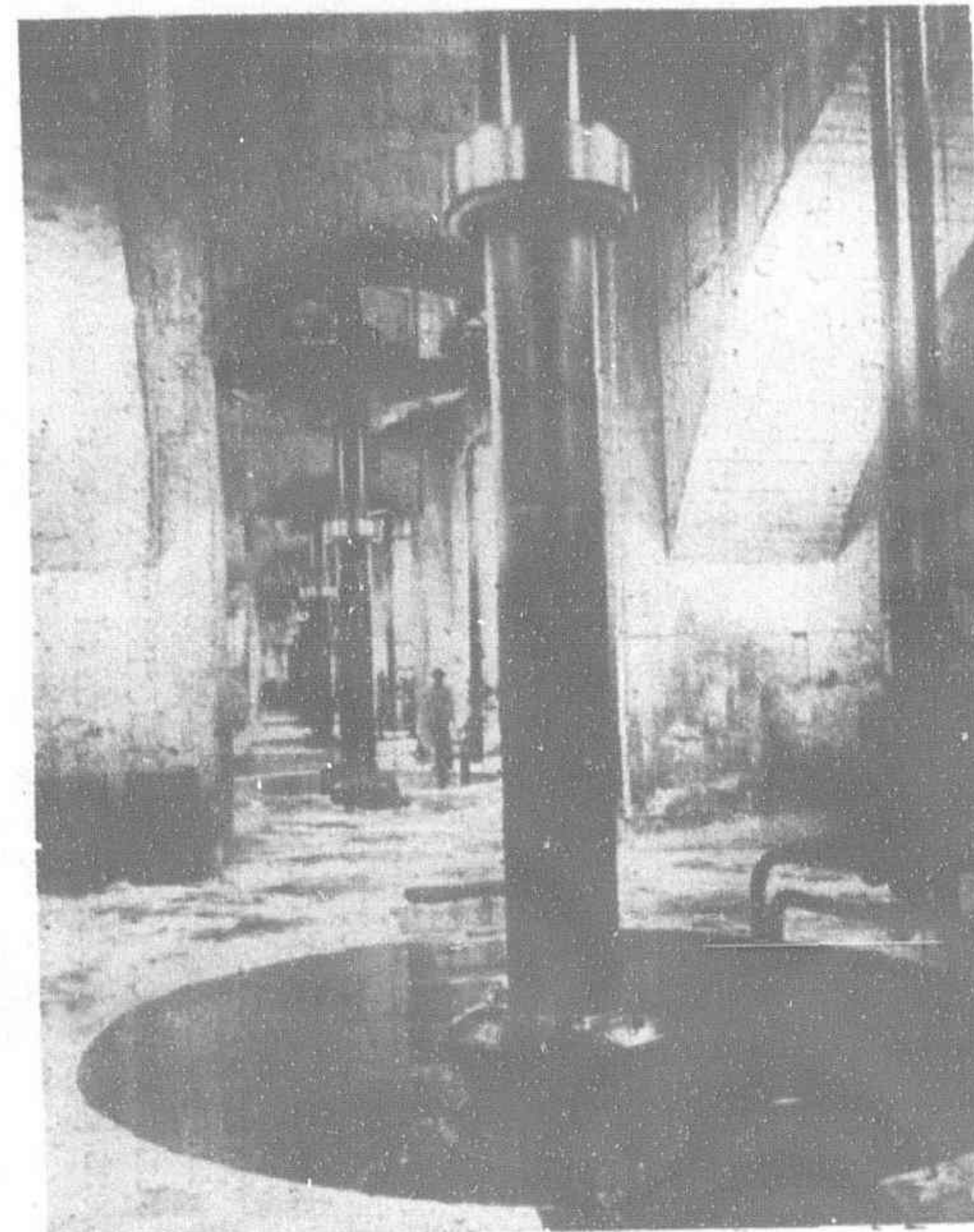
General View of Yanagawara Power Station Equipped with Three 30,000 H.P.; 300 r.p.m. Vertical Francis Turbines



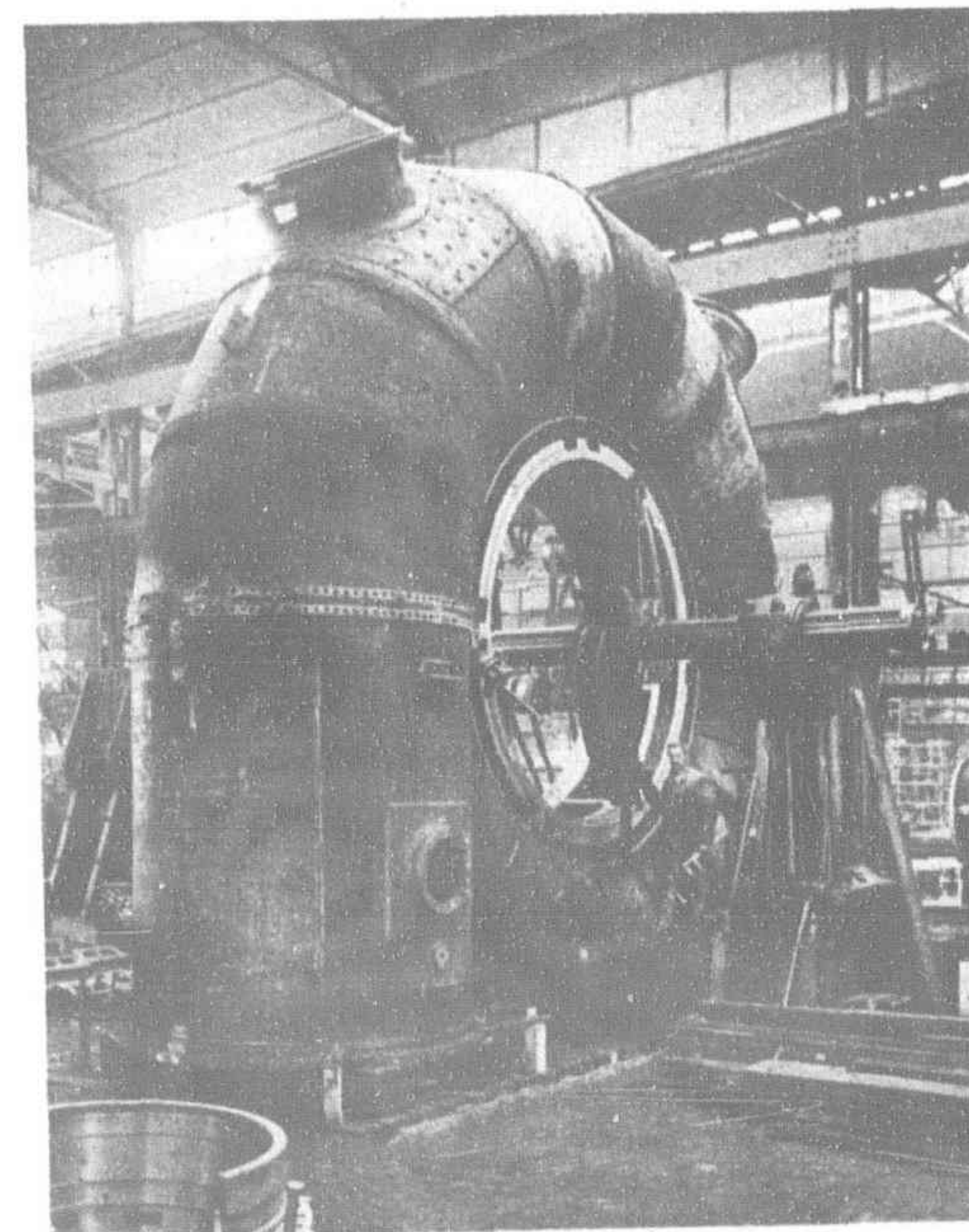
2 View of Central Oil Supply Station of the Yanagawara Power House



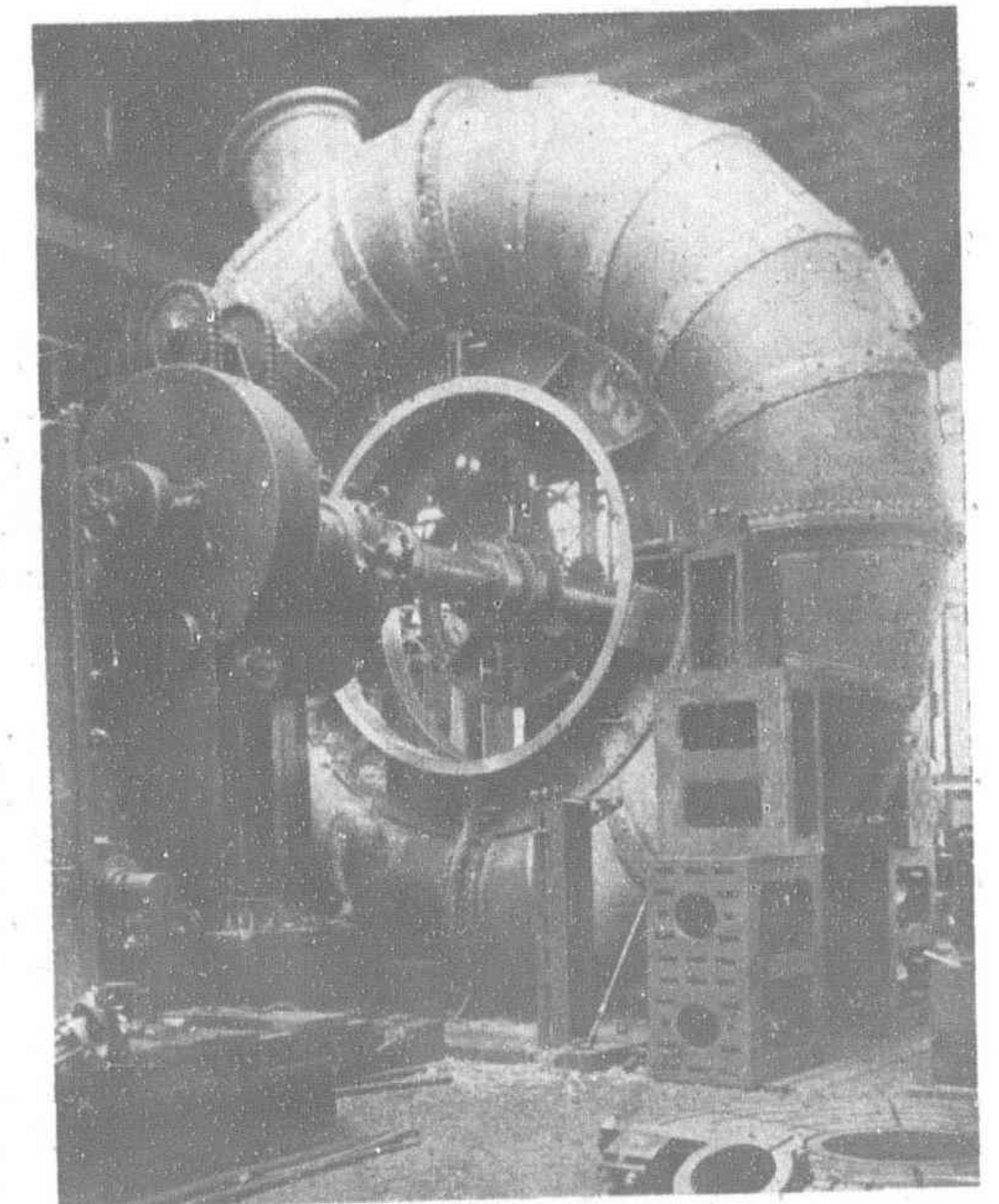
Turbine Room of Yanagawara Power Station



Toshin Denki's Akanogawa No. 1 Power Station: Six 14,000 H.P., 150 r.p.m., Vertical Francis Turbines



40,000 H.P., 300 r.p.m. Vertical Francis Turbine in Nippon Denryoku's Kanidera Power Station



15,600 H.P., 250 r.p.m. Vertical Francis Turbine Supplied to Tokyo Dento's Inawashiro No. 4 Power Station

serious reflection on the reliability of American hydro machinery. Home manufacturers, benefiting by this lesson, took steps to prevent a repetition of these disasters, which undoubtedly were impending, by effecting the needed reinforcement to many American wheels then in installation. These remedial measures proved successful, and helped to open the eyes of electric utility executives to the height which Japanese skill in electrical machinery technique had risen and home manufacturers were quick to take advantage of this favorable opportunity.

VII.—DOMINATION OF IMPORTED TURBINES AND ITS EFFECT ON JAPAN'S TURBINE MANUFACTURING INDUSTRY

From 1907 to 1914, many leading hydro corporations throughout the country, including the Tokyo Electric Light, the Katsuragawa Electric Power, the Kinugawa Hydro Power and the Inawashiro Electricity, installed, with signal success, numerous large capacity water turbines of German and Swiss manufacture. Their example was faithfully followed by a countless number of hydro power companies, large and small, projected in all parts of the country, which had a disastrous effect on the home turbine manufacturing industry and impeded its progress to a serious extent. From a far-seeing viewpoint, however, this setback was a blessing in disguise for the very foundations of the hydro turbine manufacturing industry of this country were laid during these gloomy days. The influx of water power machinery, masterpieces of the world's best makers, afforded home manufacturers the desired opportunity for comparing and analyzing the merits and demerits of these makes from the technical and manufacturing standpoints. The data collected from these studies was carefully kept for future reference, while their force of expert mechanics and operatives turned their attention to the manufacture of steam engines and other activities, pending the arrival of those days when their accumulated knowledge and skill might be used to the best advantage.

Industrialists in those days were, by tradition, inclined to favor imported articles, and the technical experts of electrical enterprises welcomed novelty in anything without regard to its economic value. As their knowledge became amplified, they were no longer satisfied with only German and Swiss turbines, and in 1910, Sweden was added to the already formidable array of competitors of the home manufacturers, by definitely entering the Japanese field.

VIII.—THE WAR AND ITS EFFECT UPON THE JAPANESE TURBINE MANUFACTURING INDUSTRY

The outbreak of the World War in 1914 cut off the chief sources of turbine supply, as the countries which were active in that industry, had become involved in the strife to the grave concern of hydro executives of this country, especially at a time when their needs for turbine units of ever growing capacity were greatest. It was not only impossible to have the many orders for turbines, placed in Germany and Switzerland, executed but, also, those already constructed could not be transported here, with the result that these orders were cancelled one after the other. The former indifference of power utility executives to domestic manufacturers gave way before the urgent need for substitutes. Home turbine makers quickly grasped the opportunity thus suddenly thrust upon them, and the results of their long research work and seasoned manufacturing skill, were brought to bear on the execution of business placed at their very doors. They now turned out water power units of many thousands of horsepower capacity, at a jump from their former status of a 1,000 horsepower output, for their largest unit. Large capacity turbines performed most admirably without giving any grounds for complaint.

The four years of the European War maintained the home manufacturing industry at a tremendous pace, and the power needs grew to immense proportions. As hydro-electric power was about the only available cheap sources of motive energy, hydro projects were springing up thick and fast to give employment, in an extraordinary degree, to domestic manufacturers of electric turbines. The Swedish manufacturers, who had just sent a driving wedge into the Japanese field, had to relinquish their vantage point, as buyers in this country could not depend upon the delivery of their machines, because of the transportation difficulty. In their place, American turbines were beginning to figure in many import negotiations.

IX.—REVIVAL OF DEMAND FOR AMERICAN TURBINES, AND THE PREMATURE COLLAPSE OF IMPORT PROJECTS

By this time American manufacturers had introduced many features of improvement in their turbines, greatly aided by new knowledge imported from Europe, a step taken following their realization that their policy of standardization was a mistake. The new products were revelations to Japanese buyers, in point of technical improvement, etc., and a section of the industry was very favorably impressed. This seemingly rising demand for American turbines, however, was nipped in the bud as the United States soon became drawn into the European vortex, and had to mobilize its industrial resources for the manufacture of arms and ammunition. Power utility executives were apprehensive that orders placed with American plants could not be depended upon for delivery any more than those from Europe and to be on the safe side home manufacturers were given preference, and they now had the good fortune of virtually controlling the market. Their manufacturing facilities were subsequently amplified and their technical skill was developed to a point where they compared favorably with those of European manufacturing concerns of long standing, thereby laying the foundation for their unquestioned prestige as one of the world's first-ranking manufacturers of electric machinery.

X.—LABOR UNREST

While the World War was the means of affording unprecedented prosperity to the manufacturing industry of this country, it also brought in its wake labor discontent for the first time in the history of Japan. A steady expansion in commercial and industrial activities was necessarily followed by a steep rise in commodity values, thus making living conditions of the laboring class unbearable. Moreover, the tendency for the concentration of wealth within the capitalist class, and its uneven distribution between the employer and the employed, was augmented as time passed. This gave the coveted opportunity to the students of European labor questions to stir up a feeling of unrest among laboring classes. Labor first demanded a more equitable basis of distribution of wealth, and to press their issue, aggressive tactics, such as the walk-out and others, were adopted to disturb the hitherto very peaceful relationship between the employer and the employed. The proprietors of manufacturing plants, who had succeeded in securing their long-awaited orders from the hitherto indifferent hydro industry executives, and who were on the point of realizing their cherished dream of reaping some benefit from their technical data collected through long years of painstaking efforts, received the jolt of their lives from a direction where they least expected trouble.

XI.—POST-WAR CONDITIONS

When the World War came to a close toward the end of 1918, inhuman as it may seem, industrial executives were panic-stricken at the rather abrupt arrival of peace, as they felt it certain that their days of abnormal prosperity were now numbered. Their apprehension gave rise to the financial panic of 1920, but many industrial projects, which were founded on a sound basis, survived the crisis, to continue their activity unmolested, taking advantage of the enormous accumulation of capital resources built up during the war time prosperity. The hydro-electric industry, for instance, was not affected by this depressing influence, to any great extent, and the water turbine market managed to keep up a certain degree of prosperity on that account.

Nevertheless, their monopoly of the market could no longer be continued in view of the fact that the many world shipping routes had resumed operations, and manufacturing firms in Europe were now redoubling their efforts to recapture the turbine markets lost during the four years of strife. Japan soon became the battle ground for hydro turbine dealers, not alone suppliers in Germany, Switzerland and Sweden, but American makers came out strong for business monopoly. The deep-rooted proclivities of Japanese hydro executives for imported machinery revived, enabling Swiss manufacturers to capture more than one-half of the turbine requirements of the country, while American manufacturers were able to secure business of no mean proportions. German makers, however, for reasons evident, were unable to reinstate themselves to any extent, falling far short of repeating their pre-war feat of capturing the bulk of the market.

(Continued on page 175).

Botocan Hydro-Electric Project

By L. ERICSON

ONE of the largest hydroelectric power developments in the Far East is now under way on the Botocan River near Luisiana, Laguna province, Philippine Islands. This is but the beginning of a \$10,000,000 power program sponsored by the Manila Electric Company. The Botocan project which will consume \$2,500,000 of this amount involves problems in material transportation, the construction of a dam, water conveyance, power house, and a transmission line to Manila.

Construction materials in the main will come from Manila by way of Pasig River and Laguna de Bay to a specially constructed wharf at Pagsanjan. Pagsanjan although 24 kilometers from the job, is the nearest point to Botocan accessible by water. At this place a garage has been located for servicing the huge fleet of motor cars and trucks necessary for transporting materials to Botocan. Besides the garage, a derrick has been erected to expedite the unloading of incoming materials and placing on trucks for shipment to the job.

The traffic on the road between Pagsanjan and Luisiana is controlled by a one-way traffic system. This was found to be necessary because of the narrowness of the roadway, particularly so in the rainy season when the shoulders are soft and unfit for traffic. The one-way traffic is greatly facilitated by gates every two kilometers interconnected by a series of telephones. Materials transportation is carried on in this way on a 24-hour schedule.

At the time work was started, the provincial road extended only to Luisiana so that it was necessary to construct five kilometers of road to the dam and an additional three kilometers to the power house site. This was carried on under adverse weather conditions. Incessant rains made the work both slow and expensive, but its completion was a vital step in the gigantic program of construction materials transportation.

With the completion of the road it was possible to start construction on the various units that makes up the project.

The water of the Botocan river will be empounded by an arched concrete dam of gravity section. The dam is an overflow type controlled by four gates 25 feet long and 10 feet high. The dam is some 180 feet in length along the upstream face and about 67 feet high from its foundation to the spillway. Piers rise above the spillway 31 feet higher making the total height of the dam about 98 feet. Anchorage will be made into solid rock both on the sides and

bottom, making a sturdy structure that will withstand the sudden floods so common to this body of water. During the period of construction of the permanent structure, temporary log dams have been placed across the river, and the water diverted thru a wooden flume. Any small amount of water that leaks through the cofferdams is removed by pumping so that excavation and concreting may proceed unhampered. To facilitate construction, the dam will be constructed in five separate sections along the arch. The space now occupied by the wooden diversion flume will be the last section of the dam to be constructed.

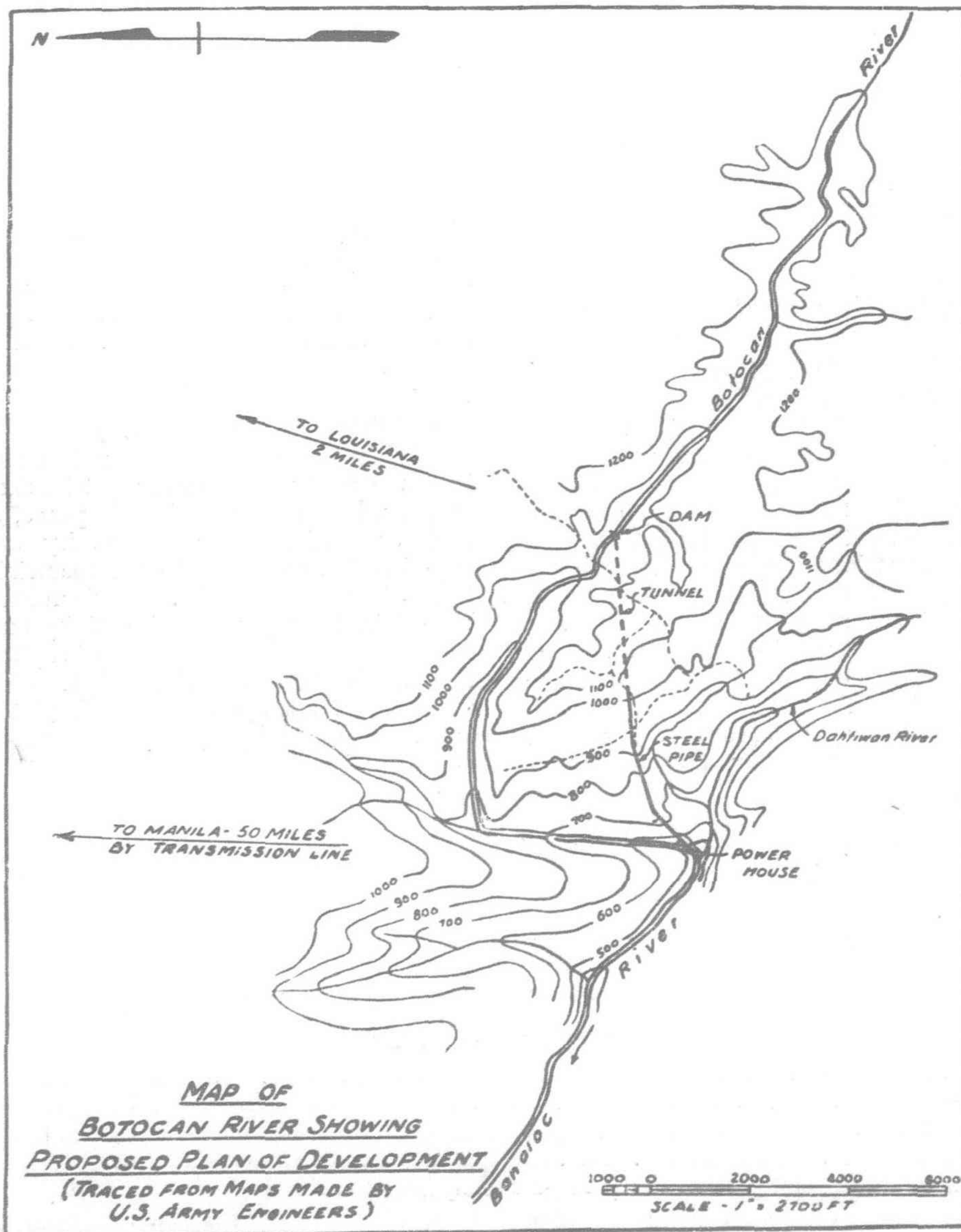
The water empounded by the dam will next enter a tunnel 4,000 feet long. The tunnel is being driven from two ends at one time. The excavation is horse shoe in shape, eight feet high and eight feet wide. Up to the present, all sorts of materials have been encountered from clay to solid rock. In clay sections where the ground is "squeezing" heavy timbering has been found necessary; in the rock sections timbering has been eliminated entirely. After the excavation is completed, the tunnel will be lined with concrete reinforced with steel bars to form a circular water passage six feet and six inches in diameter.

The tunnel at the outlet portal will connect with a steel pipe also six feet six inches in diameter which will continue alongside of the newly constructed provincial road. This will extend for a distance of 2,300 feet to a steel surge tank.

The surge tank supported on steel columns and a heavy concrete foundation will stand about 200 feet in height. The tank itself will be some 25 feet in diameter.

Leaving the surge tank, the pipe line will continue on to the top of the hill below which the power house is situated. At this point the water will take a sudden drop for a vertical distance of 470 feet. During this fall the water will be conducted in two pipes of smaller diameter to the turbines located in the power house below.

The power house will enclose three independent units. Two of these will be turbines generating 10,000 kV-A each; the other, an impulse unit will generate 1,200 kV-A. The expended water will flow into the junction of the Botocan and Dalituan rivers. Before excavation for the power house could be started, the site had to be cleared of a tremendous amount of large boulders, some being in the vicinity of ten feet in diameter. This was accomplished by drilling and loading them with

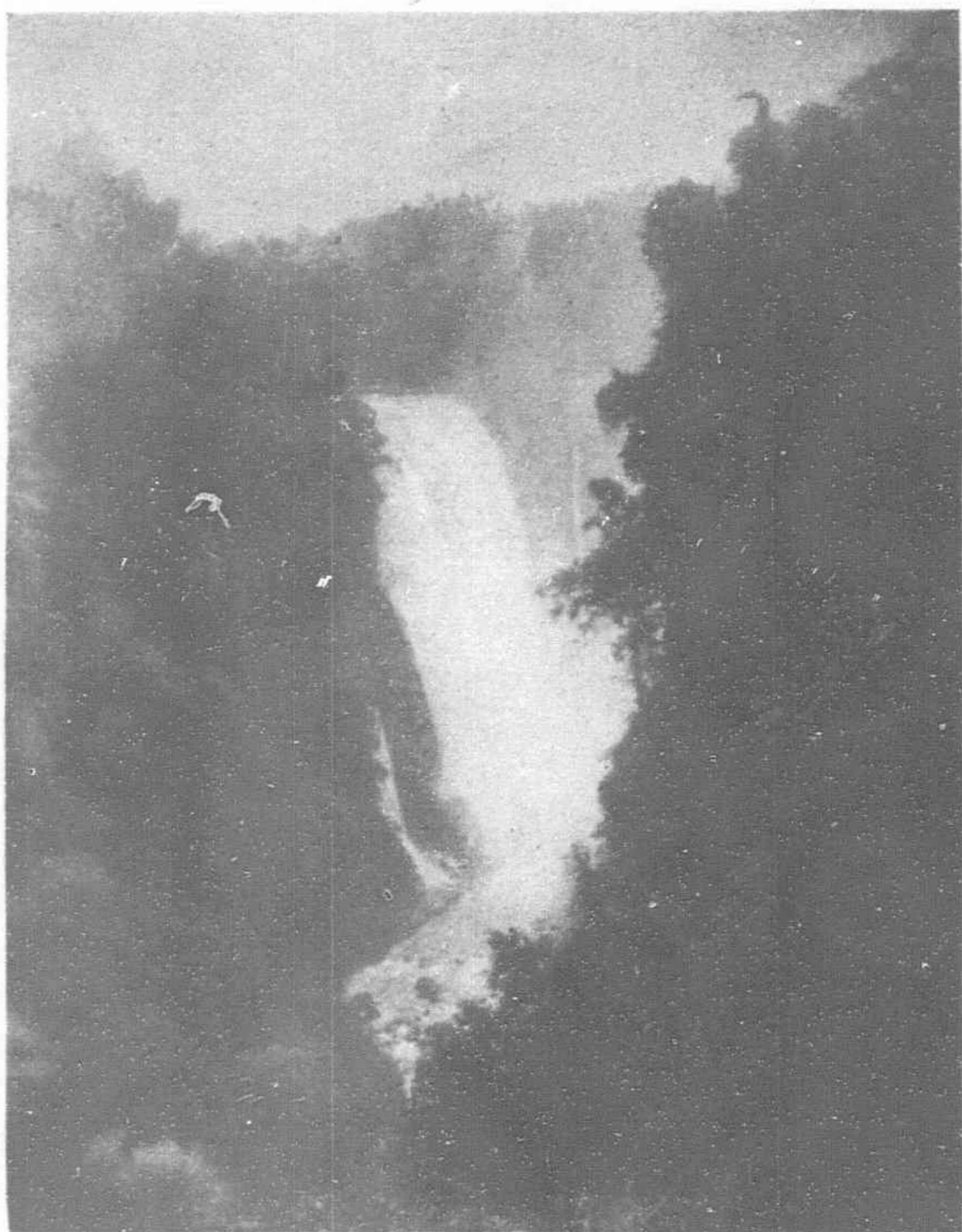


dynamite. Over one and one half tons of dynamite was used on this particular job. The excavation for the power house foundation has been carried down to solid rock for a depth of about twenty-two feet.

The current thus generated will be transmitted at high voltage to Manila. The line will follow the shore of Lagnua de Bay, a distance of 55 miles and enter Manila from the north.

Although the entire project is being constructed with the latest machinery and equipment, over 1,800 employees are on the payroll. A monthly payroll of over P.130,000.00 has brought prosperity to the entire countryside.

Every effort has been made to provide comfortable living conditions for both American and Filipino employees. Houses



A view of the Botocan Falls. This photo was taken on the north bank of the Botocan River about 300 meters away from the falls. The falls is about 200 feet high.

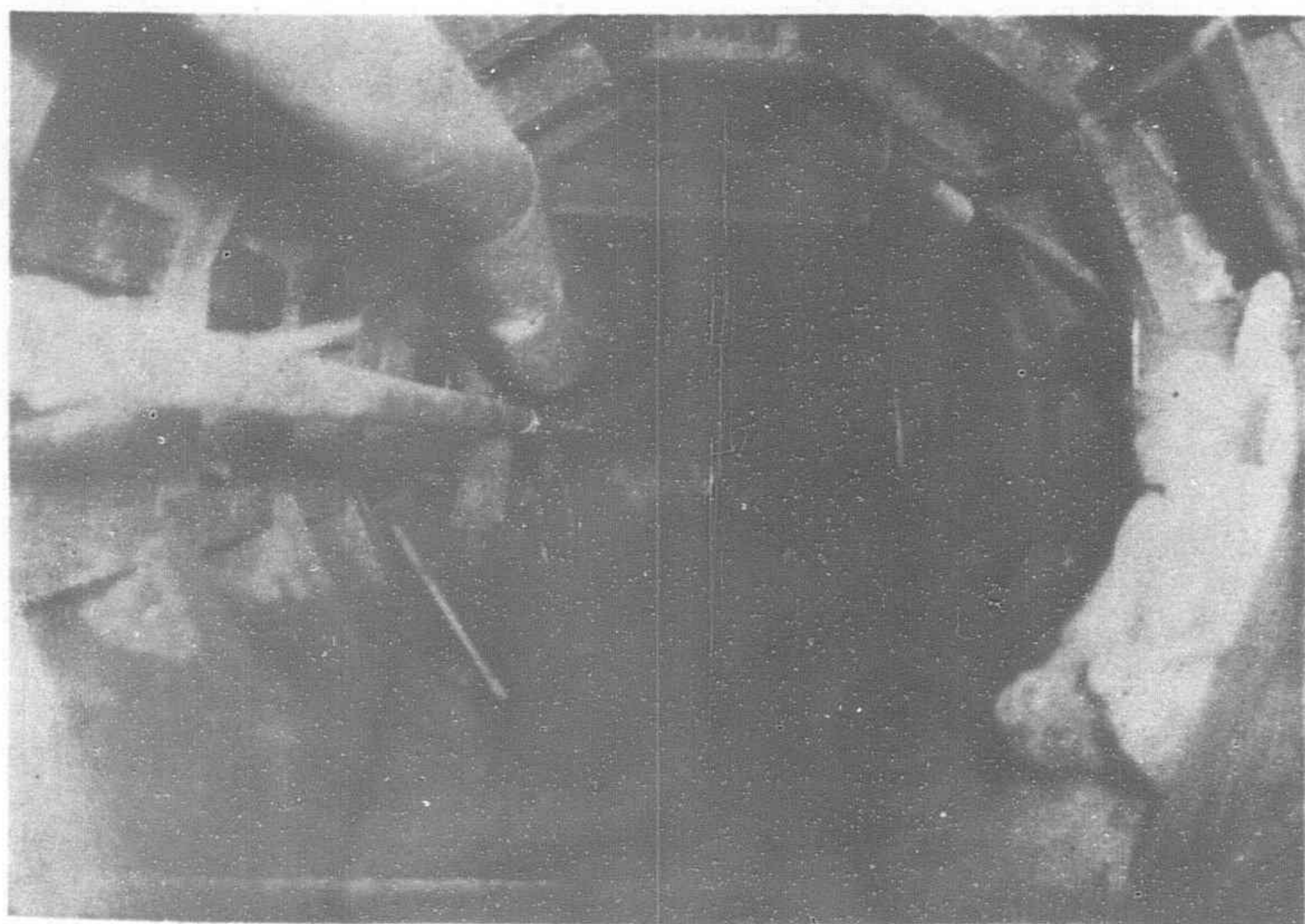


View of the power house site showing the derrick that is handling excavation. The chute coming down the hillside will handle penstock excavation and concreting materials. The hopper shown below collects penstock spoil and guides it into the industrial cars.

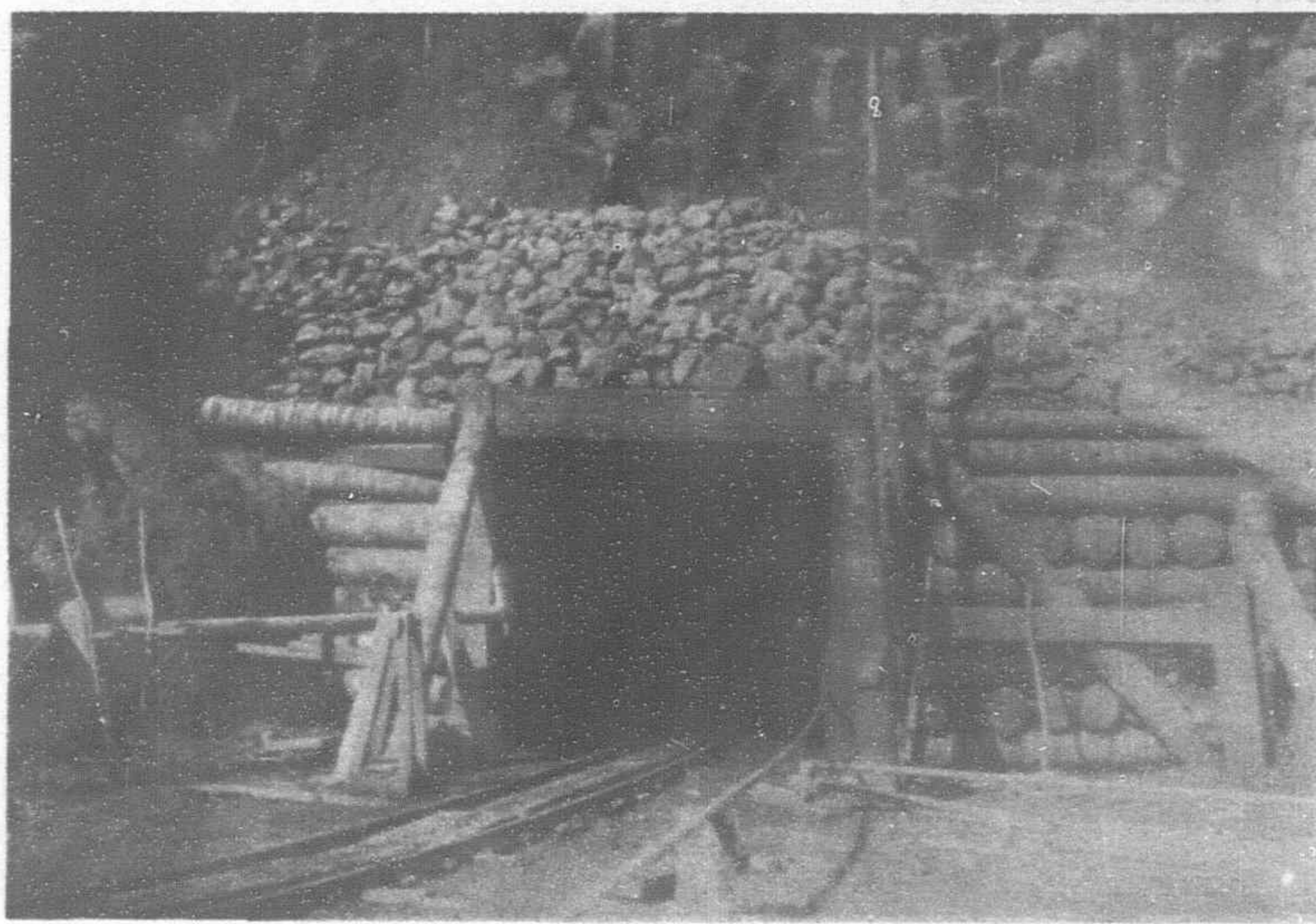
have been constructed immediate to the workers' particular job. Water and sewerage systems have been supplied. A graduate physician together with his aids provide immediate medical attention to all workers.

The construction work is being carried on by the Associated Gas and Electric Company under the superintendence of G. E. Schreiber and E. D. Bean, together with a group of construction superintendents

brought with them from the United States. Investigations, engineering and design, is being made by Charles B. Hawley and Company represented by J. K. Richardson and F. D. Matthews. The entire project as now scheduled will be completed sometime in September of this year.



Segment arch timbering used where the ground is dry but there is danger of falling boulders. Note corners are being rip-rapped with excavation taken from stone sections of the tunnel. At rear is timbering of small tunnel which is driven ahead of the larger tunnel where loose rock is encountered in top of excavation.



Intake portal of tunnel showing pipe lines and spoil track in place.

Water Turbine Development in Japan

(Continued from page 173).

Because of the successful operation of the machinery supplied by them during the war years, however, the prestige of home manufacturers was now firmly established, so that, with the exception of units of an extra large capacity, they were competing on an equal footing with foreign suppliers to gain business at prices which could not be matched by oversea rivals. Under

these circumstances, the majority of the turbine manufacturing plants in this country, were able to maintain, intact, the manufacturing facilities, which had greatly expanded during the war period, and their business conditions were now on a satisfactory basis.

(Continued in May issue.)

Electric Mining Locomotive for China

THE locomotives are designed to run on an 18-in. gauge track composed of 25 lbs rails, and to take the supply from overhead conductors at 550/600 volts direct current.

Each locomotive is equipped with two totally-enclosed weather-proof motors rated at 18/20 H.P. on a one hour rating. The drive is transmitted from the motors (one of which is connected to each axle) through gearing consisting of a nickel steel hardened and ground worm and a phosphor bronze worm wheel, giving a reduction of approximately 8 to 1. The casing of the worm gear forms a dustproof housing and the gear is run in an oil bath.

The current is collected from the overhead line by a spring loaded reversible pantagraph collector and conducted through a traction type circuit breaker to tramway type controller. This controller gives seven running speeds in either direction, and in addition two braking notches.

The main frame is of rolled steel built-up section securely rivetted and stayed, provided with machined guides for the axle boxes, and combined buffers and towing hooks giving three coupling positions.

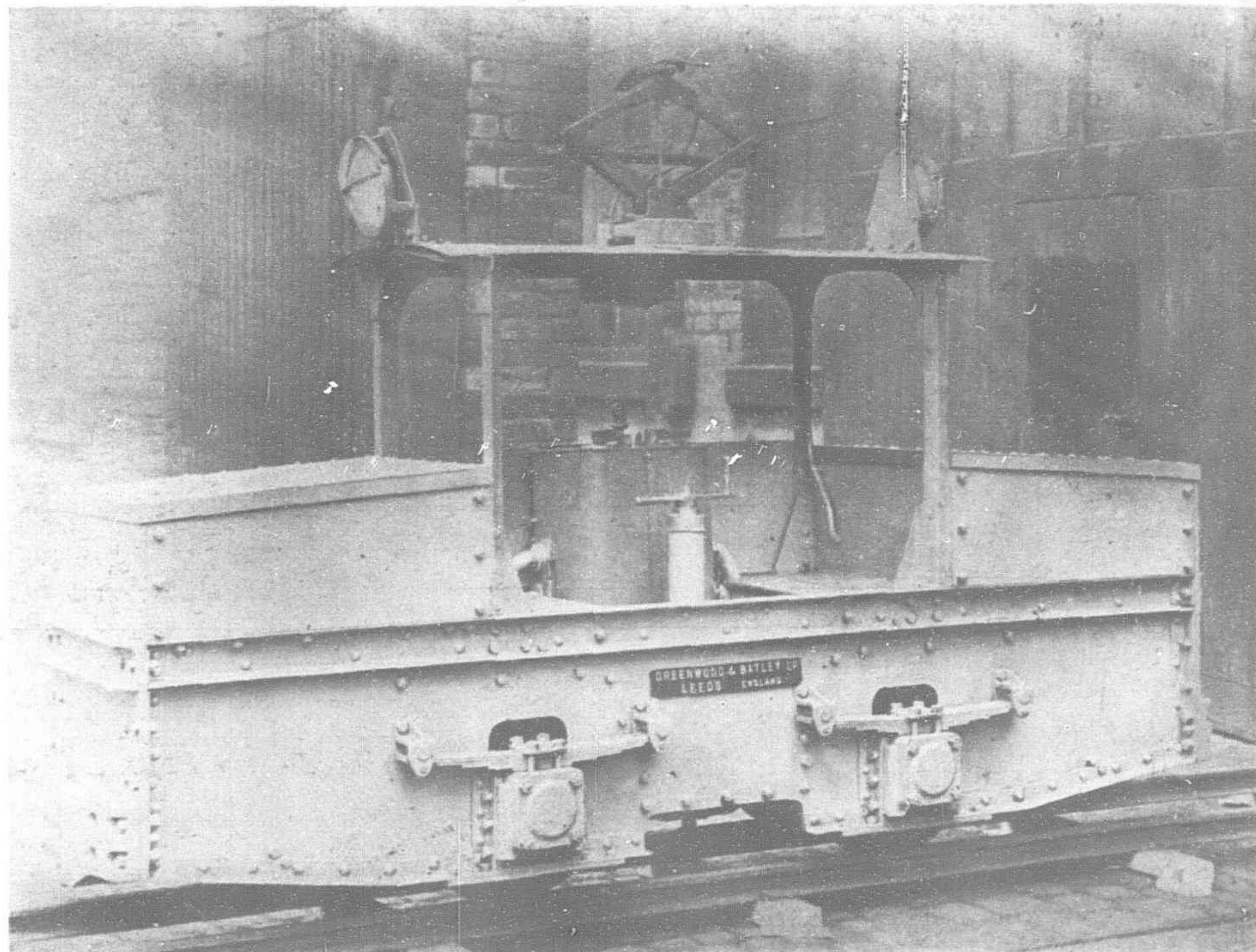
Ball and roller bearings are fitted throughout and all bearings are enclosed in dust-proof housings.

Cast iron shoe brakes are fitted to all four wheels, and operated by a balanced mechanism from a handle situated in the driver's cab.

The driver's cab is centrally situated with seats so arranged that the driver can face in the direction of travel and have an uninterrupted line of vision. Powerful headlights are fitted in the roof of the cab.

The locomotives are designed to give a drawbar pull of 2,000 lbs. when running at a speed of $6\frac{1}{2}$ m.p.h. On test these figures were obtained and a maximum drawbar pull of 3,000 lbs. recorded. This can in actual practice, be increased by providing ballast in the two containers which are provided for this purpose.

The approximate weight of the locos in running order is four tons and provision is made for carrying an additional one ton of ballast.



Electric Locomotive Made by Greenwood & Batley, Ltd. for a Chinese Mining Company

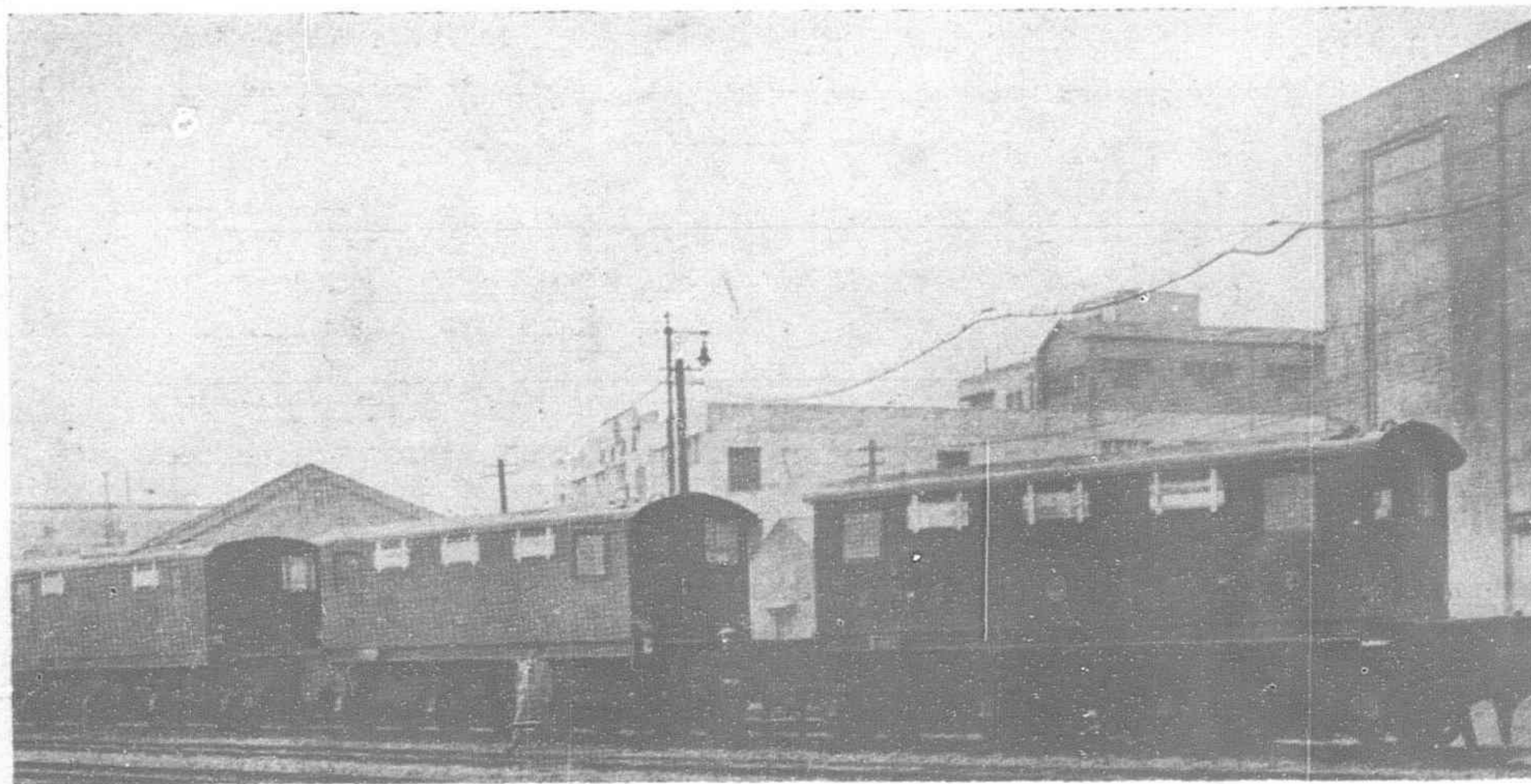
The builders of these electric locomotives, Messrs. Greenwood and Batley, Ltd., of Leeds, England, are also completing a small battery driven mine locomotive for a Chinese mining company.

English Electric Locomotives for Japan

THREE locomotives delivered to the Hokuso Tetsudo K. K. in the spring of this year by the English Electric Company are representative of a line of standard 0-4-4-0 units which that company has developed for service on D.C. systems of 3-ft. 6-in. gauge, operating at 1,200 or 1,500 volts. As will be seen from the illustrations, which show the locomotives ready to be taken to their destination after arrival in Japan, they are of the box cab design with two driving positions. They have a total weight of 35 tons each, and will be operated from an overhead line at 1,500 volts. D.C., from which current will be collected by a single pantograph of the double-pan type which is raised by compressed air and lowered by springs.

The power equipment consists of four self-ventilated motors, connected in pairs in permanent series, with a one-hour rating of 120 H.P.; the corresponding speed is 18 miles per hour with a gear ratio of 81 to 15.

Control is effected on this company's all-electric camshaft system and is arranged to give nine series and six parallel notches. The operating circuits are served by a 120-volt supply obtained from a 2 kW. motor-generator set driven by a 1,500-volt motor. The braking equipment consists of a Westinghouse AMF air-brake, with a D.H. 25 air compressor driven by a 1,500-volt motor, while hand brakes are also provided, with an operating wheel in each cab.



Three English Electric Locomotives for the Hokuso Railway, Japan

Further British Iron and Steel Amalgamation Likely

Although negotiations are now proceeding between the two great Tees-side industrial undertakings of Dorman, Long & Co., and the Furness group of companies for working arrangements which will enable greater economy of production, no definite scheme to secure that end has yet been formulated. There is a feeling, however, that some form of amalgamation may follow the operation of a working arrangement.

A few months ago the undertakings of Bolekow, Vaughan & Co. were absorbed by Dorman, Long & Co., and a scheme for close co-operation between Dorman and the Furness group would include practically the entire iron and steel industry on the Tees-side, with the exception of those works owned by Pease & Partners. Such a scheme would secure the rationalization of the industry in Middlesbrough and district.



PUBLISHERS' ANNOUNCEMENT

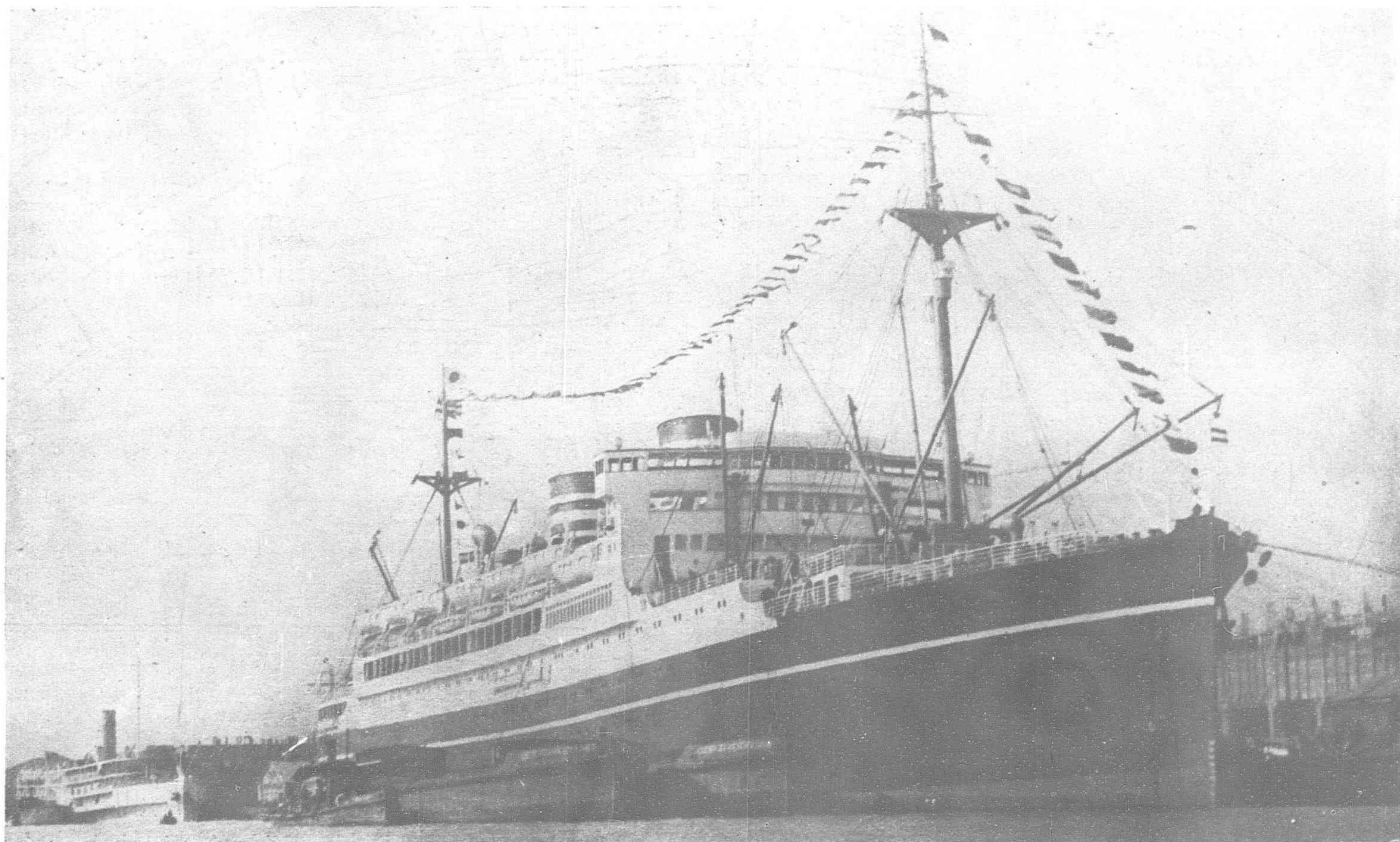
THE *Far Eastern Review* commences with this issue the publication of the monthly supplement, *The Asiatic Marine Review*, which will be devoted to shipping, shipbuilding, port works and river improvement, dockyards, wharves, warehousing, marine engineering and related industries.

The publishers of the *Far Eastern Review* believe that there is an immediate demand for a special department devoted to marine engineering articles in the *Far Eastern Review* because of the constantly increasing development and growth of maritime interests in Asia. The competition among the three most important steamship lines in placing upon the Pacific the most modern type vessels, equal to the best Atlantic liners, if not in size, at least in comforts and service, is only an indication of what is to take place in shipping circles during the next decade. Shipbuilding yards in Japan and China are working to capacity. The growth of shipbuilding industry in Japan has often been described in the columns of the *Far Eastern Review*; the industry in China is still in its infancy, but work is progressing with startling rapidity. The entire world of suppliers of engines, boilers, steel plate and the countless items that enter into shipbuilding are finding a thriving market in Asiatic countries. The supplement, *The Asiatic Marine Review*, will be devoted to a description of the affairs of that market, particularly to a recording of the engineering work in that market.

The *Far Eastern Review* is eminently fitted to undertake this task. For twenty-seven years, it has maintained the highest journalistic and engineering standards as the only engineering journal in the English language published in the Far East. During this long period, the *Far Eastern Review* has become a source of constant information on all phases of engineering work in the Far East. The impact of Western civilization upon the East is most easily sensed by the growth of interest in Asiatic countries in engineering developments: railways, roads, public works, bridges, the electrification of the means of production, the improvement of waterways, and finally the organization and growth of self-sufficient engineering industries in Asiatic countries.

Maritime engineering plays a very great rôle in this record. From many standpoints, it plays the leading rôle, for the great Asiatic nations are maritime nations. Japan's proud fleet, carrying an Asiatic flag into every ocean, is the symbol and the evidence of Asia's interest in maritime engineering. China will one day follow, when outstanding political problems no longer interfere with business and industrial developments. Yet, while Asia enters upon this maritime career, shipping from western countries is on the constant increase, Great Britain, the United States, France, Holland, the Scandinavian countries are all placing increasing more shipping on the Pacific and Indian oceans.

Indeed, the Pacific is at last becoming the center of the universe!



The New De Luxe N.Y.K. Motor Passenger Vessel "Asama Maru" Alongside Wharf at Shanghai

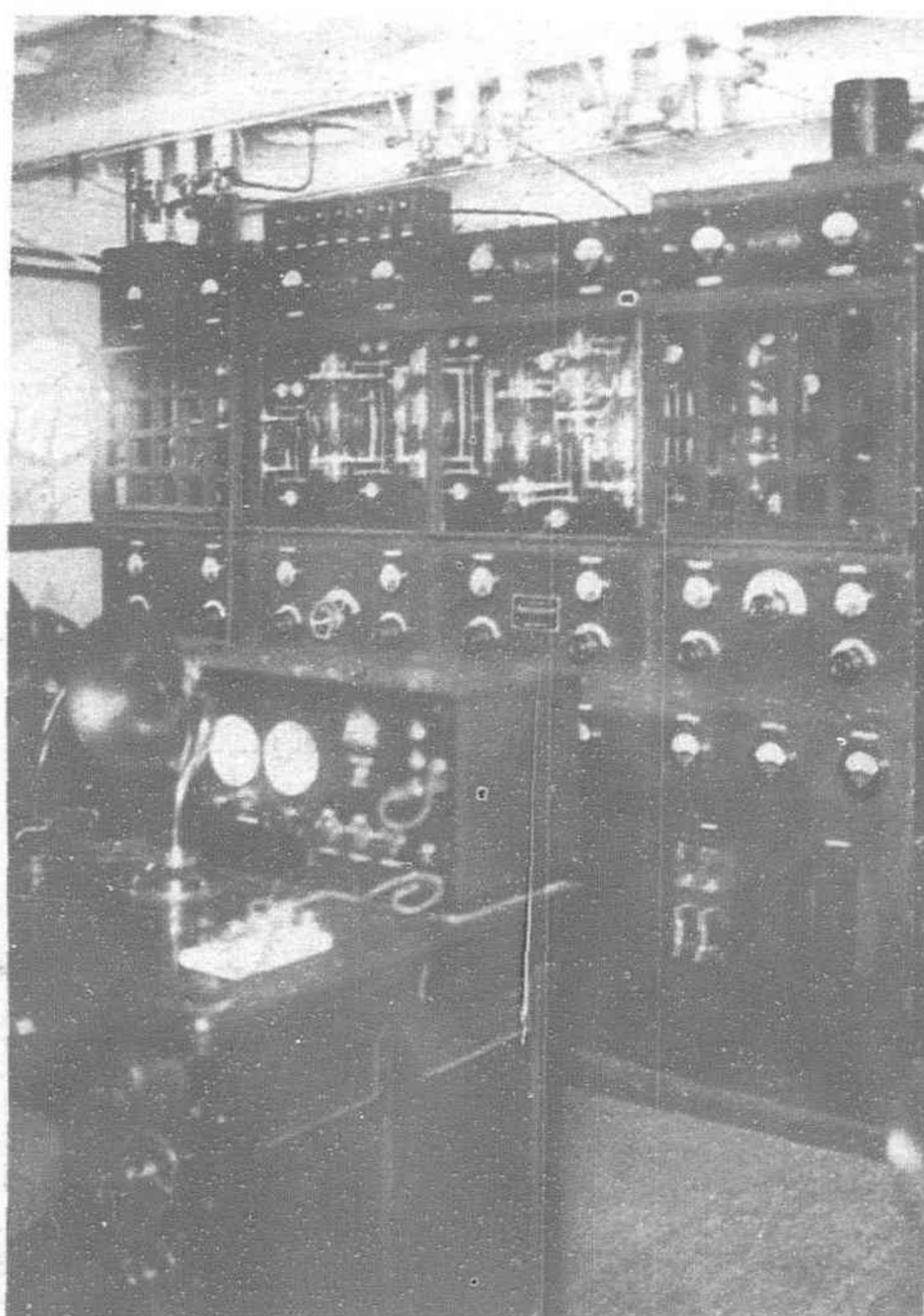
Engineering Features of the N. Y. K. Motor Passenger Liner, "Asama Maru"

By Y. TAJI, M. Eng., M.I.N.A., M.I.M.E.*

THE completion of the motor liner *Asama Maru* is an event of real importance in the history of Japanese Shipbuilding, for she is the largest vessel yet constructed in that country for mercantile service, and is the biggest motor liner turned out in any country this year. Together with her sister ships, *Chichibu Maru* and *Tatsuta Maru*, she is destined to improve the Nippon Yusen Kaisha's service between the Far East and California, and the comparative rapidity of construction in itself represents a notable achievement. She was completed on September 15, having been laid down on September 10, 1927, and launched on October 30, 1928.

The vessel was designed under Japanese Government Regulations and Freeboard Rules, and classified by Lloyd's as + 100 A1 "with freeboard."

The trials were far beyond expectations and the maximum speed attained by the vessel was 21.01 knots, with a mean speed of 20.71 knots. The stability and seaworthiness were excellent. As regards vibration of the ship and the noise of the engines,



Wireless Telegraph Office

there is not any difference whatever compared with the best turbine-driven vessels.

Leading Particulars

Length overall ...	584-ft.
Length between perpendiculars ...	560-ft.
Breadth moulded ...	72-ft.
Depth mld. (to upper deck sides) ...	42-ft. 6-in.
Depth mld. (to bridge deck sides) ...	51-ft. 6-in.
Depth mld. (to promenade deck sides) ...	60-ft.
Depth mld. (to boat deck sides) ...	69-ft.
Draught at full load ...	28-ft. 6-in.
Displacement at full load ...	21,837 tons
Total weight of cargo ...	8,170 tons
Total volume of cargo ...	301,600 cu. ft.
Cold storage capacity ...	12,800 cu. ft.
Cargo oil capacity ...	300 tons
Fuel oil capacity ...	3,100 tons
Fresh water capacity ...	1,500 tons
Gross register ...	16,947 tons
Net register ...	10,018 tons
Trial speed ...	20.71 knots
Sea speed ...	19 knots
First-class passengers ...	222
Second-class passengers ...	96
Third-class passengers ...	504
Officers and crew ...	330
Main engines ...	4 8-cyl. Sulzer
S.H.P. Total ...	16,000
No. of shafts ...	4

*This official technical description of the *Asama Maru* is taken from a reprint of an article published in the *Motor Ship*, December, 1929.

General Arrangement and Hull Construction

The vessel has three continuous decks extending over the whole length, i.e., the upper deck, the second deck and the third deck.

At the forward and after parts of the engine-room the fourth deck and the orlop deck are arranged. Over the upper deck are a bridge deck covering nearly the whole length of the ship and a promenade deck extending about three-quarters of the length of the ship. A boat deck about 270 ft. long covers the promenade deck, and is raised by 2 ft. at the top of the first-class lounge, and by 2-ft. 6-in. at the first-class smoking-room. At the forward end of the boat deck are the captain's bridge and navigation bridge, and at the aft end of the promenade deck a docking bridge is provided. Deck houses are built on the boat deck for engineers' cabins and an electric lift directly communicates with the engine-room and the engineers' cabins. Thus there are nine decks, and the height from the keel to the navigation bridge is 87-ft. The ship is subdivided by 10 water-tight bulkheads into fore peak tanks, No. 1,

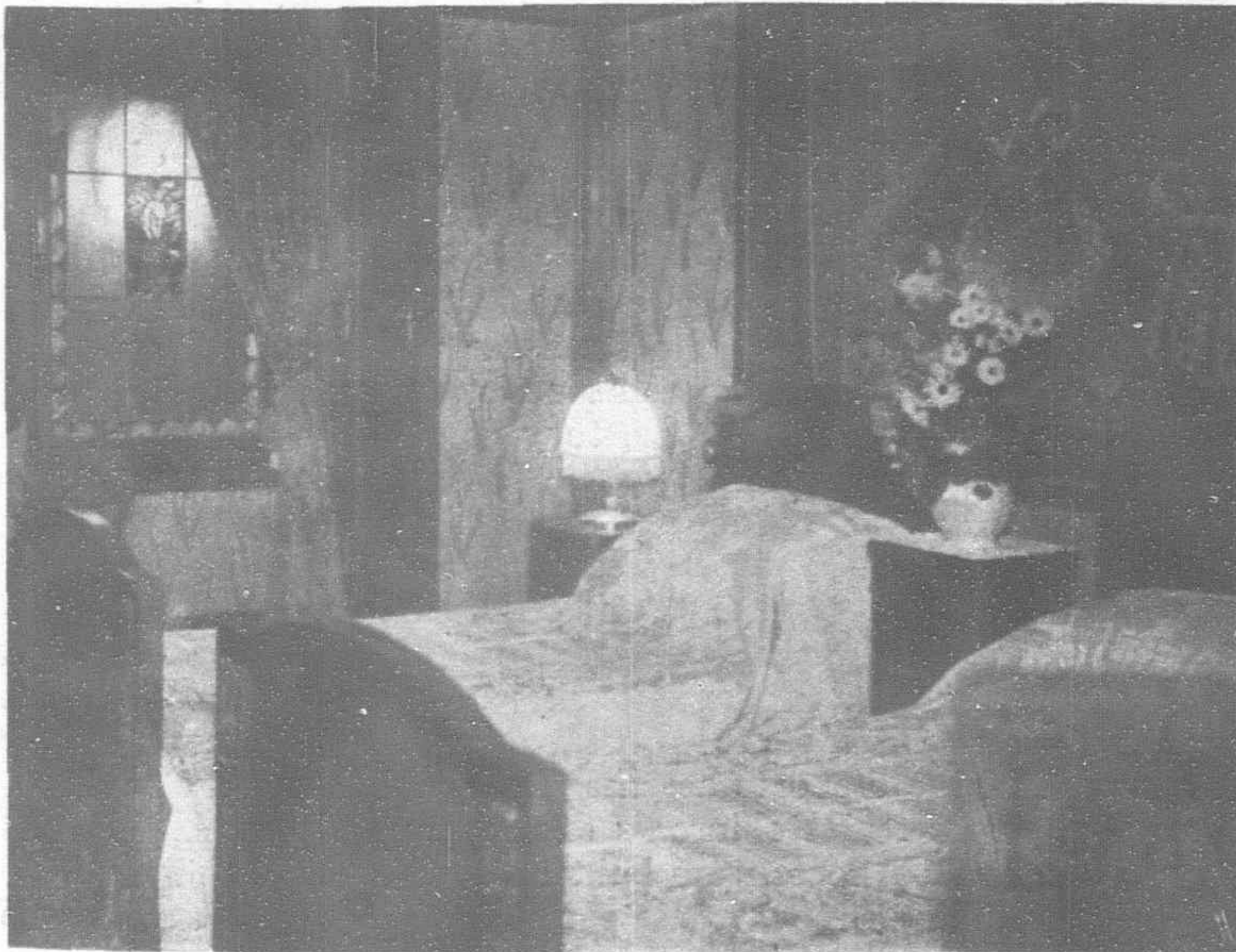


Suite (No. 220)

In the bottom structures the height of the double bottom under the main engine-room is increased and many side girders are added which extend considerably beyond the engine-room bulkhead, while weight saving is obtained by reducing the thickness of the outside plating. The engine beds are rigidly fastened to the tank top with four rows of bolts, while the tops of the side girders and floor plates are in actual contact with the inner bottom plating. The connection of the side frames and the double bottom plating under the engine-room is reinforced, and special web frames are arranged in four or five frame spaces. Main pillars are provided in four rows and as many more are fitted as the cabin arrangement permits. In this way vibration has been reduced to a negligible amount.

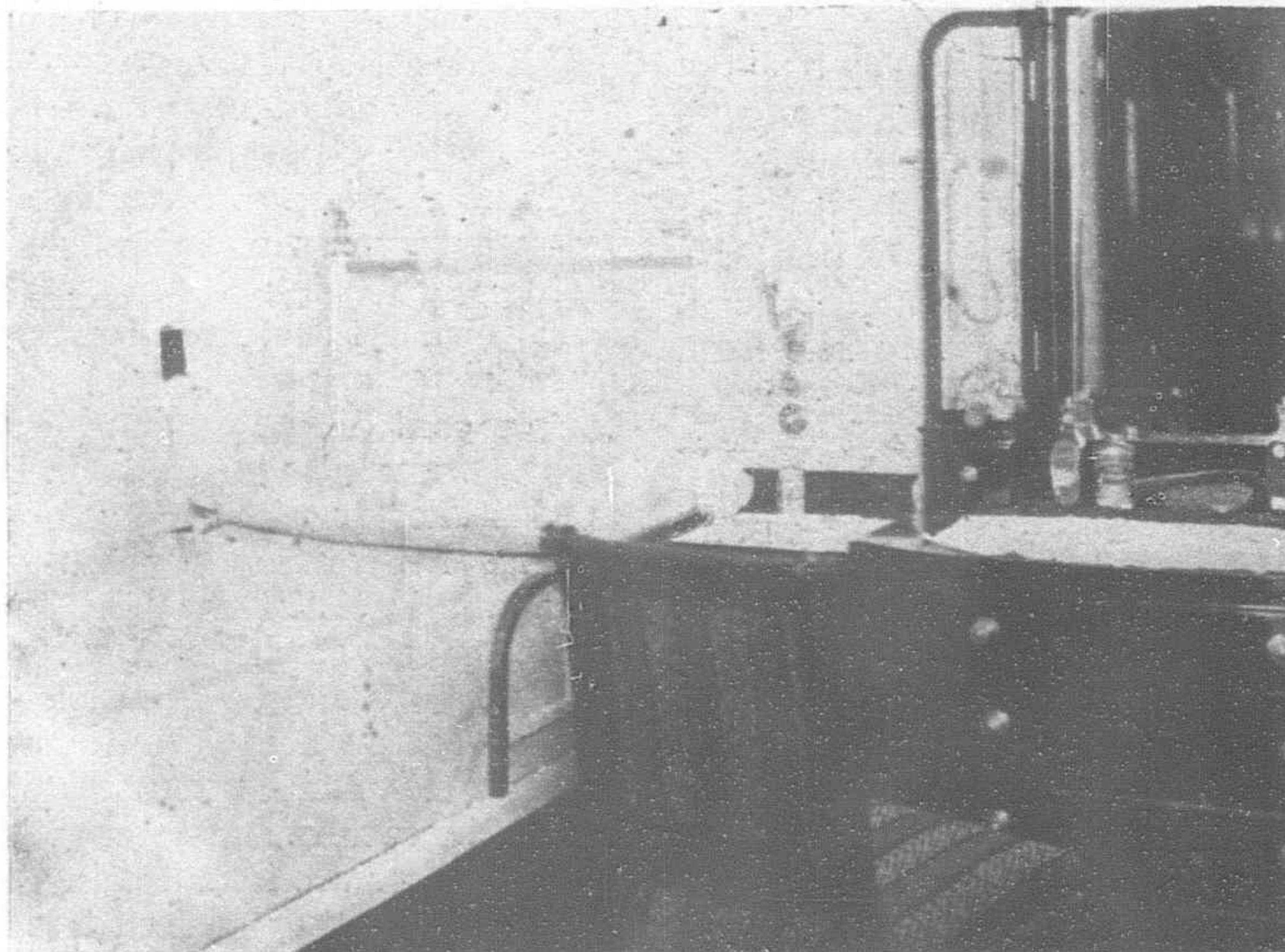
For the prevention of vibration due to the propellers numerous web frames are fitted to the aft peak tanks and shaft tunnels. Not only are all water-tight bulkheads extended to the upper deck, but also many fire-preventing steel bulkheads are fitted on all decks above the upper deck.

As regards the prevention of noise from the engine-rooms, elaborate sound



Suites De Luxe, "Asama Maru"

No. 2, No. 3 cargo holds, cargo-oil and fuel-oil tanks, auxiliary engine-room, main engine-room, fresh water tanks, Nos. 4 and 5 cargo holds and aft peak tanks, and is so designed as to be quite safe when any two adjacent compartments are flooded. The double bottom extends the whole length and is used for the storage of fuel oil and fresh water. The promenade deck covering the main part of the ship is taken as the strength deck. Consequently, the ratio of the length and depth is small in comparison with that of ordinary ships. There are no expansion joints, so that the deck and longitudinal cabin bulkheads are compensated to withstand stresses.



First Class State Room: "Asama Maru"

penetration experiments were carried out with various sound-preventing materials. Amorsite flaps consisting of asbestos materials having shown the best results in the experiments, all inner surfaces of the main and auxiliary engine-room bulkheads, and all casings and walls between the engine-rooms and cabins are lined with Amorsite blocks of not less than two inches in thickness.

Main and Auxiliary Machinery

The engine-rooms are divided into a main engine-room and an auxiliary machinery-room; in the former are installed the main engines and

auxiliaries directly used in conjunction with the main engines, while the latter is provided with electric generators, boilers and their auxiliaries.

The main engines are installed under the second deck, as they require limited height for lifting pistons. The space above the engine-room can be utilized for crew's cabins and galleys, and consequently the deck arrangement was easily and comfortably designed.

To ensure the rapid handling of cylinder covers and pistons, four sets of $2\frac{1}{2}$ -ton cranes are provided at the top of the main engine-room and all operations for the lifting are carried out by hand.

Five ventilating machines on the boat deck and two others supply fresh air to the main and auxiliary engine-rooms respectively, thus enabling the air in the engine-rooms to be changed 40 times per hour.

The main engines were supplied by Sulzer Brothers and are of the same design as those of the sister ship *Tatsuta Maru*, which were manufactured in the Mitsubishi Nagasaki works.

Each of the four engines has eight cylinders, 680 mm. in diameter, with a piston stroke of 1,000 mm., the total normal output being 16,000 s.h.p. at 120 r.p.m.; on the official speed trials a mean output of over 19,000 s.h.p. was developed for three hours' continuous running without any sign of vibration, overheating of the bearings or imperfect combustion. Except the injection-air compressors and the fuel-oil pumps directly connected to the main engines, all the auxiliaries are electrically driven.

The construction of the Sulzer Diesel engine is well known to our readers and need not be discussed. As indicated, the engine beds, with flat bottoms, are fastened to the double bottom.

Each engine is provided with two sets of injection-air compressors, connected at the fore end of the engine with 180-degree crank angles, one to another. The compression is in three stages, the low pressure being double acting. If two or three compressors break down the rest will supply ample air to enable the four engines to work at full power.

The manœuvring platforms are at the forward end of each engine and on the engine-room floor; all necessary handles, indicators and signals are concentrated there, ample space being provided at the front of the engines.

The fuel-oil pumps are driven by eccentrics from the air compressors and are situated near the manœuvring platform so that inspection is easily carried out.

Electric Auxiliary Machinery

For the supply of scavenging air to the main engines three sets of Brown-Boveri turbo-blowers are provided, one acting as spare. The blowers are directly connected to 363 kW. electric motors, and each can supply 1,200 cubic meters of air per minute against a head of one meter of mercury. These blowers are installed in a suction chamber; the air from the boat deck is taken to this chamber through vertical trunks insulated against noise and is drawn in by the blowers. This chamber is provided with another suction from the main engine-room, so that the blowers can assist ventilation of the engine-room whenever necessary.

In order to simplify the piping system the lubricating-oil and cooling-water systems are independently arranged on both sides of the ship. Two sets of electrically driven geared lubricating-oil pumps and centrifugal cooling-water pumps are provided for the two main engines on each side, of such capacity as to allow one of each type of pump to remain as spare.

The cylinders and cylinder covers of the main engines are cooled by fresh water, for which three electrically driven centrifugal fresh-water pumps are provided, leaving one as spare. The fresh water from the pumps after cooling the cylinders and covers returns to the double-bottom cooling fresh-water tank through coolers. The salt water from the cooling salt-water pumps cools the pistons, exhaust manifolds, air compressors, fresh-water coolers and lubricating-oil coolers.

To give warning of the sudden stopping of lubricating pumps and cooling-water pumps, alarm lamps are fitted to the driving motors. Alarm whistles and bells are provided to notify the stoppage of flow in the lubricating-oil and cooling-water pipes.

Starting-air Service

To replenish the starting air for the frequent reversals of the main engines at entering and leaving ports, two sets of electrically

driven air compressors are fitted in the auxiliary engine-room, one being of the four-cylinder type with a capacity of 1,200 cubic meters per hour at 70 atmospheres at 400 r.p.m., directly connected to a 380 h.p. electric motor. The other is of the two-cylinder type running at 400 r.p.m. and delivering 600 cubic meters of compressed air per hour at 70 atmospheres and directly connected to a 200 h.p. electric motor. Both of these machines are of the usual Sulzer three-stage high-pressure type.

Fourteen starting-air bottles are provided at the aft bulkhead of the auxiliary engine-room, each bottle having a capacity of 800 cubic meters at 70 atmospheres. Four low-pressure air tanks are fitted behind the main switchboard, each containing eight cubic meters of air at a maximum pressure of 32 atmospheres.

Dynamos

Four 450-kW. generators and one of 100 kW. are installed in the auxiliary engine-room; the former are driven by Allen six-cylinder 675 b.h.p. engines with a cylinder diameter of 410 mm., a stroke of 600 mm., and a speed of 250 r. p.m. One is a spare. The smaller generator comprises a Niigata Diesel engine and a Mitsubishi dynamo, and is used in port. Current is supplied at 225 volts.

Two boilers are installed in an isolated compartment at the forward end of the auxiliary engine-room for heating, cooking, oil tank heating, whistles, etc. These are of the cylindrical type with a diameter of 10 ft., and a length of 10 ft. 6 ins., the pressure being 120 lb. per sq. in. White's oil-fuel-burning system is used.

Anchors and Cable Arrangement

The anchors are of Hall's stockless type. The Wilson windlass for 3-in. cables with a lifting speed of 30-ft. per min. is driven by a 140 b.h.p. Scott motor, and there are four Napier mooring capstans of 15 tons capacity coupled to 145 b.h.p. Scott motors, besides two 75 h.p. 5-ton auxiliary capstans.

Life-saving Equipment

Life-saving appliances have been installed in accordance with the latest requirements of the Japanese Government regulations, the United States Steamboat Inspection Service and the British Board of Trade, and, moreover, they comply in all respects with the rules recently laid down by the International Convention for the Safety of Life at Sea, 1929. The outfit of lifeboats includes 12 Class 1A lifeboats, six decked lifeboats, two motor lifeboats with Thornycroft 35 h.p. engines (the latter having wireless and searchlights and a sea speed of 7.5 knots), all of 30-ft. length and approved for 60 to 70 persons. Further, one 24-ft. emergency boat and one 24-ft. Japanese junk are provided. Notable features of the equipment of the lifeboats are the adoption of the Fleming hand-propelling gears and Robinson's disengaging gears. All lifeboats except the decked boats were built in the Nagasaki shipyard.

For handling the boats, six pairs of davits of the gravity type and eight pairs of the quadrant design have been supplied, all of the Welin-Maclachlan type. The davits are worked by eight Welin's and four Maclachlan's boat winches coupled to Scott motors.

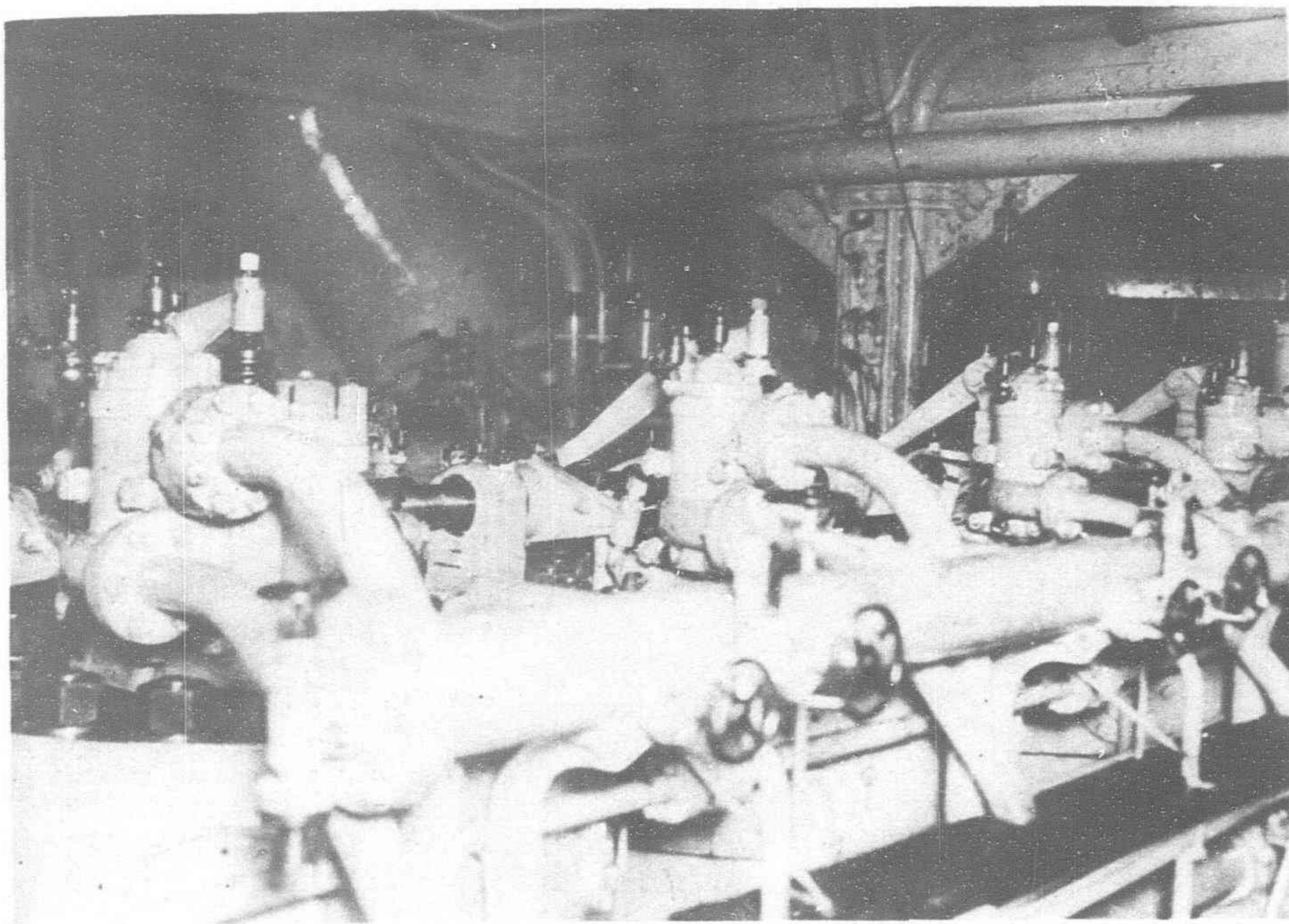
Further, eight Gladwells' buoyant apparatus, 18 lifebuoys and two Whitby night buoys are provided, the latter being throwable by special electric motors designed by the shipbuilders.

The steering gear, built by Brown Bros., is of the electric-hydraulic type, with two sets of Janney pumps and 55 h.p. electric motors, one being a spare. The steering gear can be controlled by Brown's telemotor, by Sperry's two-unit self-steerer in the wheel house, or by hand on the docking bridge. The electric motors can be controlled by a push-button in the steering-gear compartment. Siemen's electric helm indicator and the Sperry self-steerer are installed in the same compartment.

Twelve 5-ton winches and four 3-ton winches of the Scott type are installed for five hatchways. The derrick booms are Mannesman's steel-drawn tubes of 38 ft. to 50 ft., which are fitted to two masts and two derrick posts.

Seventeen Stone's automatic hydraulic water-tight doors are fitted, which can be immediately controlled from the navigation bridge in case of emergency. Two electric-hydraulic pumps and accumulators are installed in the auxiliary machinery room.

An emergency generator is fitted on the middle part of the boat deck. The 40-kW. generator is Japanese-built.



Top Plate Main Engine, "Asama Maru"

The fire doors are of Japanese make, with automatic rolling shutters and art-metal sliding doors. For fire prevention Lux-Rich fire alarms and fire extinguishing apparatus are fitted. For the cargo holds, provision stores, baggage rooms, silk stores, mail rooms, paint rooms, lamp rooms, engine rooms, etc., CO₂ gas pipes are arranged, 60 CO₂ gas bottles being fixed in the engine-room. Hand fire-extinguishers are provided in many places. Foamite Fire-foam extinguishers are also fixed. Further, Derby Fire Sentinel alarms are fitted to every cabin and public room, so that any fire will at once be notified to the navigation bridge.

For emergency pumping a Drysdale's S.O.S. vertical pump is installed in the engine-room, and this will discharge 140 tons of water per hour.

Various electric, steam and oil cooking apparatus are fitted for both European and Oriental cooking. Thermotank Punkah air supply and inductor exhausts discharge all heat and smell in the kitchens, where the whole air supply is changed every minute.

Brine pipes are led to the cold stores in the galley, instead of ice boxes. The refrigerating chambers, provision store and kitchens communicate by Karl Frol electric lifts and Shepherd's goods lifts. A provision lift is also provided for transportation of food to the pantries for the officers' cabins on the boat deck and Japanese rooms.

As the laundry is for 850 passengers, 300 officers and crew, as well as for all the linen in use on the ship, the installation is on a large scale. The majority of the apparatus was supplied by the American Laundry Co., including electric washers, extractors, rollers, presses, dampeners, shapers, irons, etc. A drying room with steam pipes and fans is also provided.

All sanitary apparatus for the first-and second-class passengers, and the ship's senior officers is of British manufacture, and the others were made by Japanese porcelain manufacturers.

The vessel has the most up-to-date hot and cold, fresh- and salt-water service. For hot fresh-water supply the Storage type horizontal calorifiers of British Steam Specialities, Ltd., are fitted, which will supply 1,000 gallons of water per hour at 180 degrees F.

Hot sea water can be supplied, by a similar installation, at 1,400 gallons per hour, for all baths and various uses, except the fore and aft crew's compartments.

In summer time, the jacket cooling water for auxiliary machinery is available for the purpose, and the calorifiers and pumps will then become only spares.

Further, two Compactum-type sea water evaporators and six fresh-water filters of Buh-ring's pressure type are installed, the total capacity being 2,400 gallons per hour.

Communication and Transportation Appliances

A Waygood-Otis electric elevator is provided, through five decks, which will carry seven passengers at a speed of 120 ft. per minute. The electric lift for the engineers is also of the same make and communicates between the engineers' cabins on the boat deck and the engine-rooms.

The baggage and provision lifts each carry 10 cwt. at 100-ft. per minute. The galley service lift capacity is 110 lb. at 100-ft. per minute.

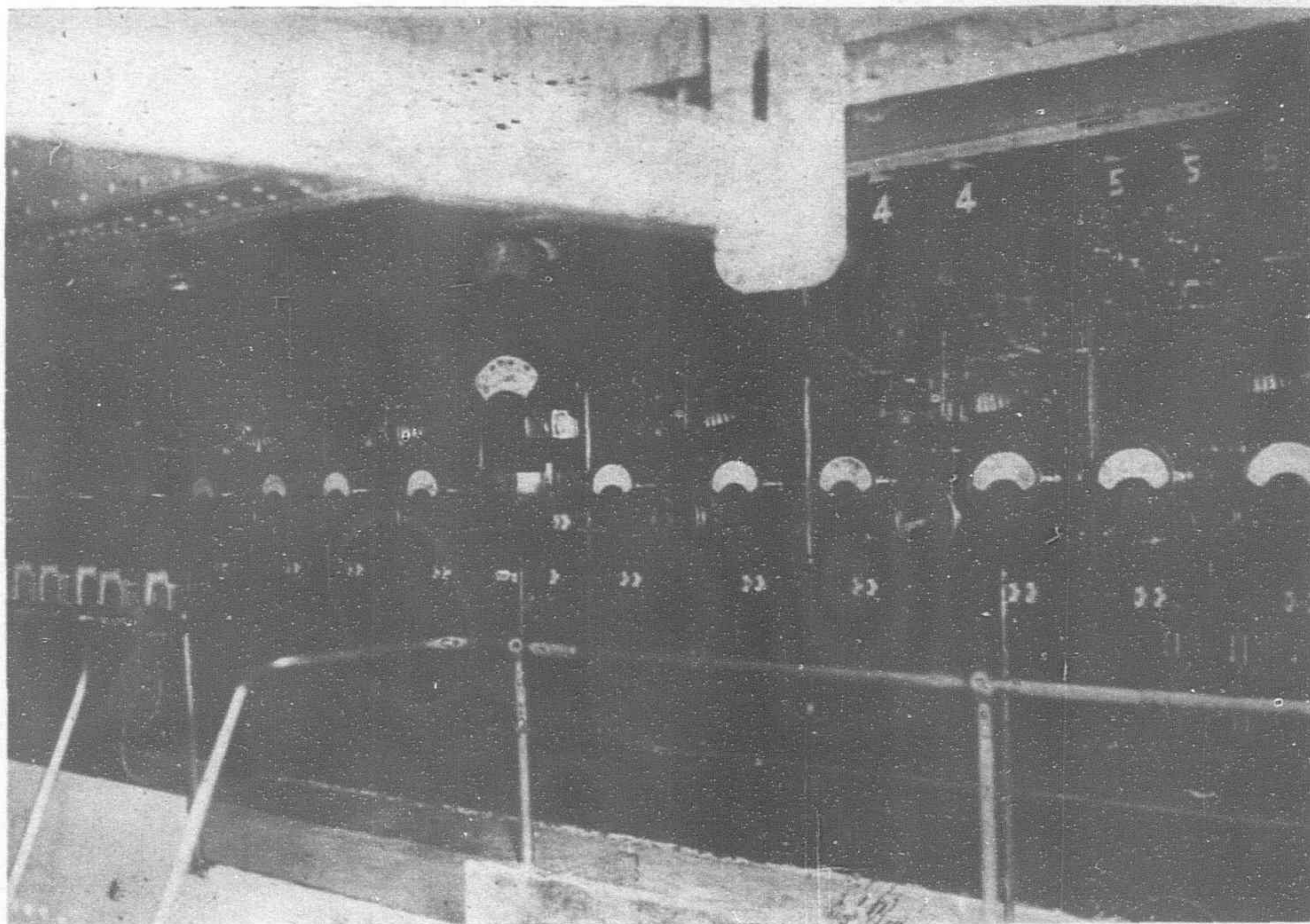
Heating and Ventilating

Both the electric and steam heating systems are adopted. The first-class dining saloon, corridors, swimming pool, gymnasium, the second-class public rooms, officers' and engineers' cabins on the boat deck, crew's compartments, the third-class cabins and public rooms, hospital, offices, etc., are steam-heated, while all the first-class public rooms, the first- and second-class staterooms, etc., are electrically heated. The electric heaters for the first- and second-class cabins are decorative space heaters provided by the Mitsubishi Electric Works, numbering 129, while for the first-class public rooms and suite rooms 60 Archibald Low's Morganite electric heaters are installed.

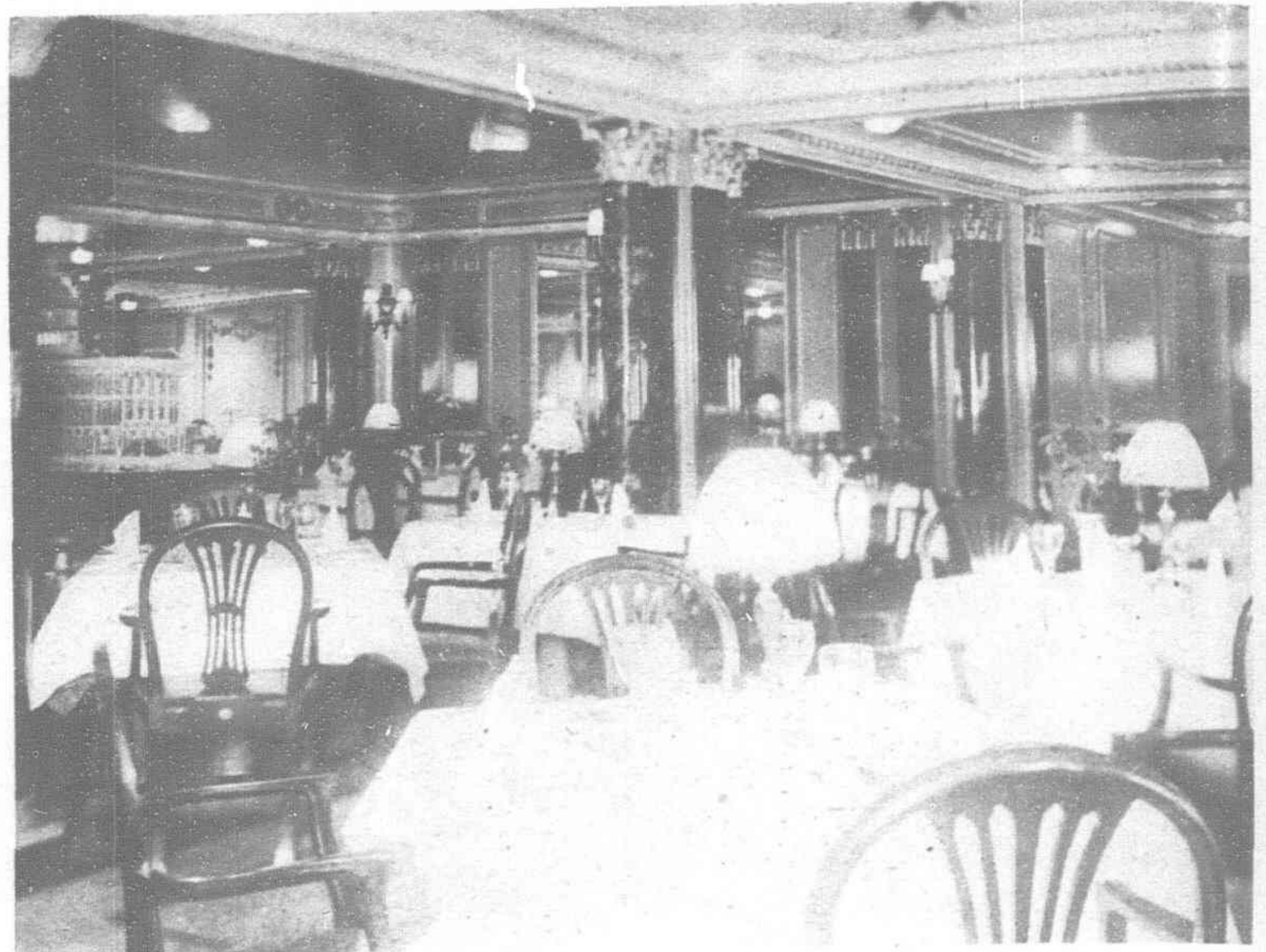
Natural and mechanical ventilation is adopted. The electric ventilating machines are of the noiseless slow-speed type of the Thermotank Co., and are installed on the deck-house roofs for the supply and exhaust of air all over the ship. The total number of electric ventilating machines is 78, of 150 h.p.; the length of the ventilation trunks 13,000 ft., and the number of Punkah louvres is 1,400.

Navigating Appliances

The navigating appliances include a gyro compass of Sperry alternating current type, with the main gyro on the middle of the boat deck. Steering repeaters are installed, one on the gyro-pilot, one in the wheel house, one on the roof of the wheel house, one in the captain's room and one for the Kolster radio direction finder. An automatic course indicator is also provided. A Sperry automatic steerer of the magnetic-clutch type is fitted in the wheel house.



Main Switchboard, "Asama Maru"

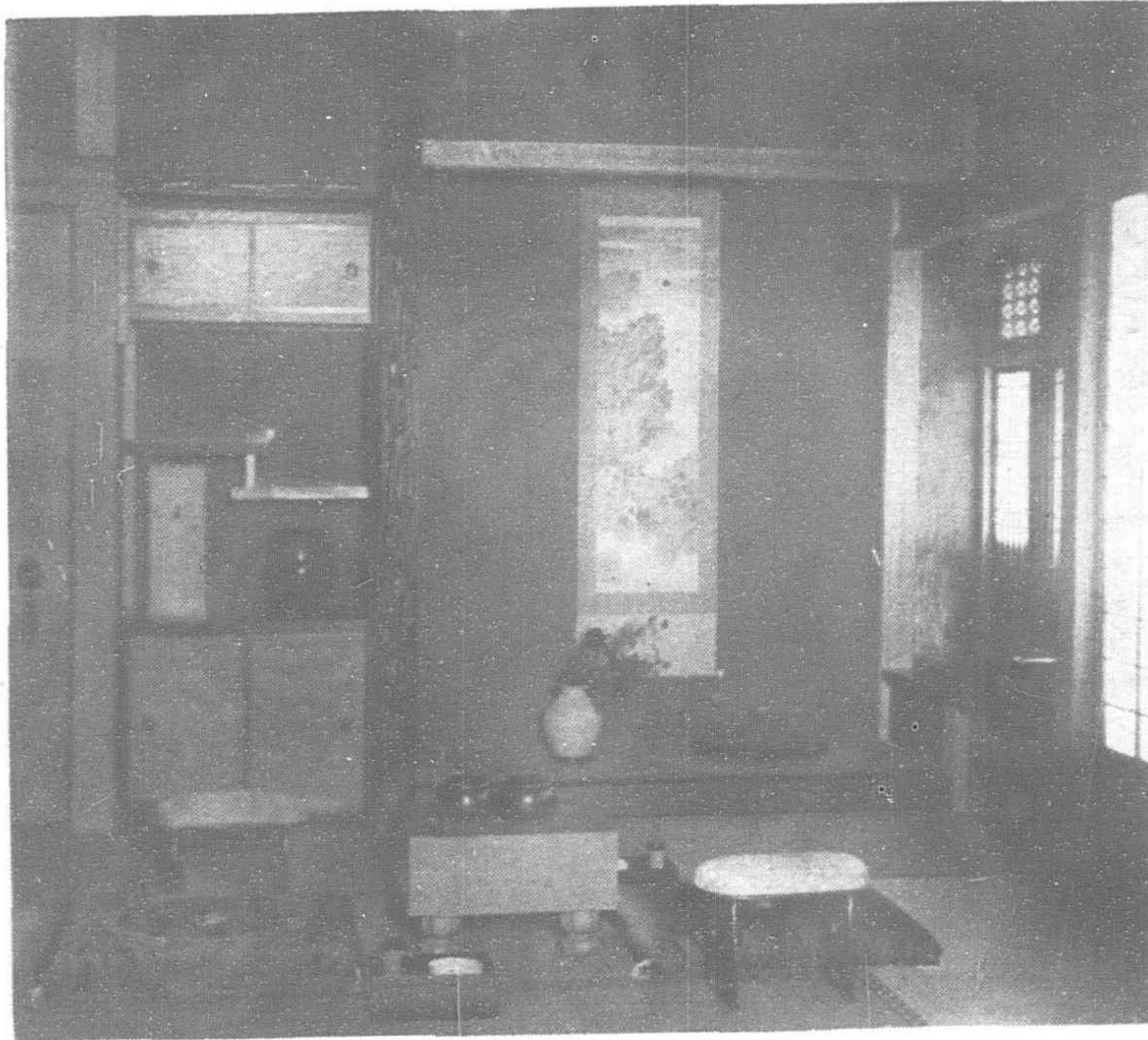


"Asama Maru": First Class Dining Saloon

To control four sets of main engines both side telegraphs are mechanically connected to operate together. Two sets of steering and docking telegraphs and one set of anchor telegraphs are provided. Evershed and Vignole's electric revolution indicators are fitted. Electric propeller signals, designed by the Nagasaki Mitsubishi Works, give information to the bridge by four red and green lamps regarding the rotation of the propellers.

A Svenska's hydraulic Salog is provided. One of the indicator dials is fitted in the wheel house and the other is in the captain's bedroom.

The change of fore and aft draughts is shown on the Pneumercator indicator fitted in the first mate's office. The sounding machine is of Kelvin's electric type. Two Kent's clear-view screens, a wireless direction finder, a $1\frac{1}{2}$ -meter rangefinder



"Asama Maru": Japanese Room

and an 18-in. searchlight are fitted. Graham's loud-speaking telephones intercommunicate with the wheel house, main and auxiliary engine-rooms, steering-gear compartment and the docking bridge.

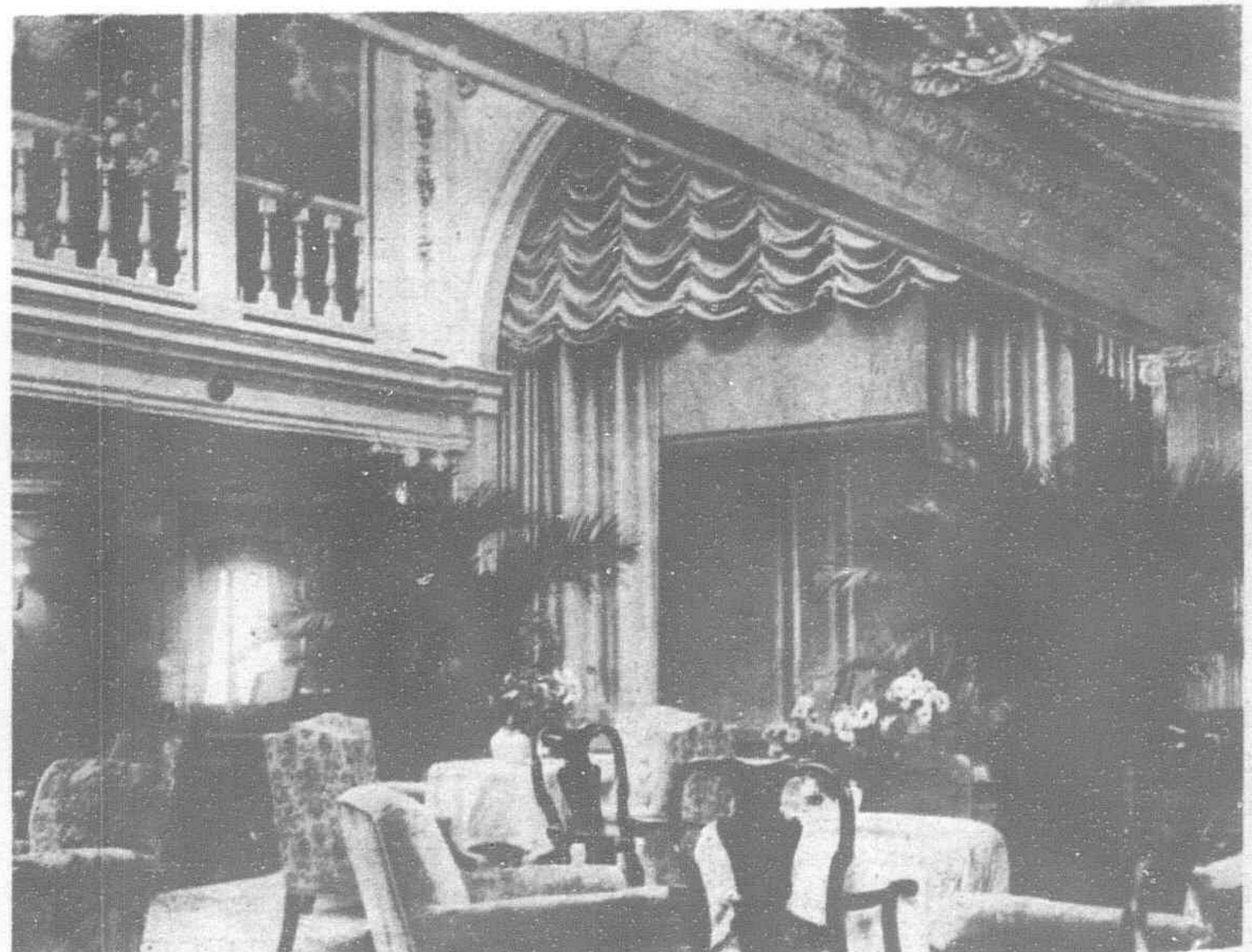
Seven sets of hydraulic tank indicators are provided, the dials being in the engine-room. To measure the depth and overflow of the swimming pool an indicator and alarm bells are fitted. Communication is also possible between the swimming pool and the engine-rooms.

Cooling and Refrigerating Plant

The vessel having a 300-ton frozen-cargo hold, a 280-ton refrigerating provision store, ice boxes and ice-water tanks, two sets of 190,000 B.T.U. electric refrigerating machines are installed. These are of the Kobe



"Asama Maru": First Class Smoking Room

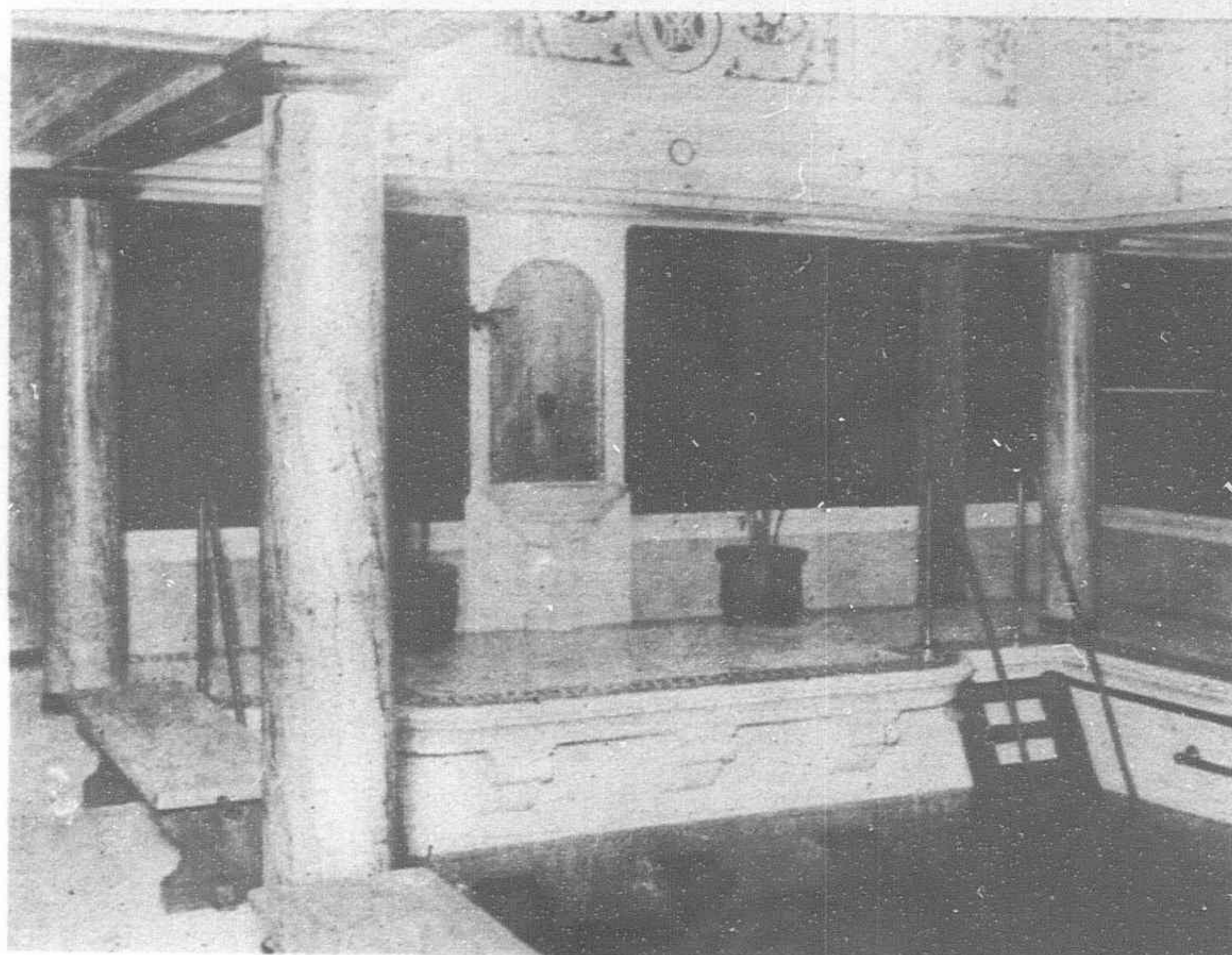


First Class Lounge

N.Y.K. PASSENGER LINER "ASAMA MARU"



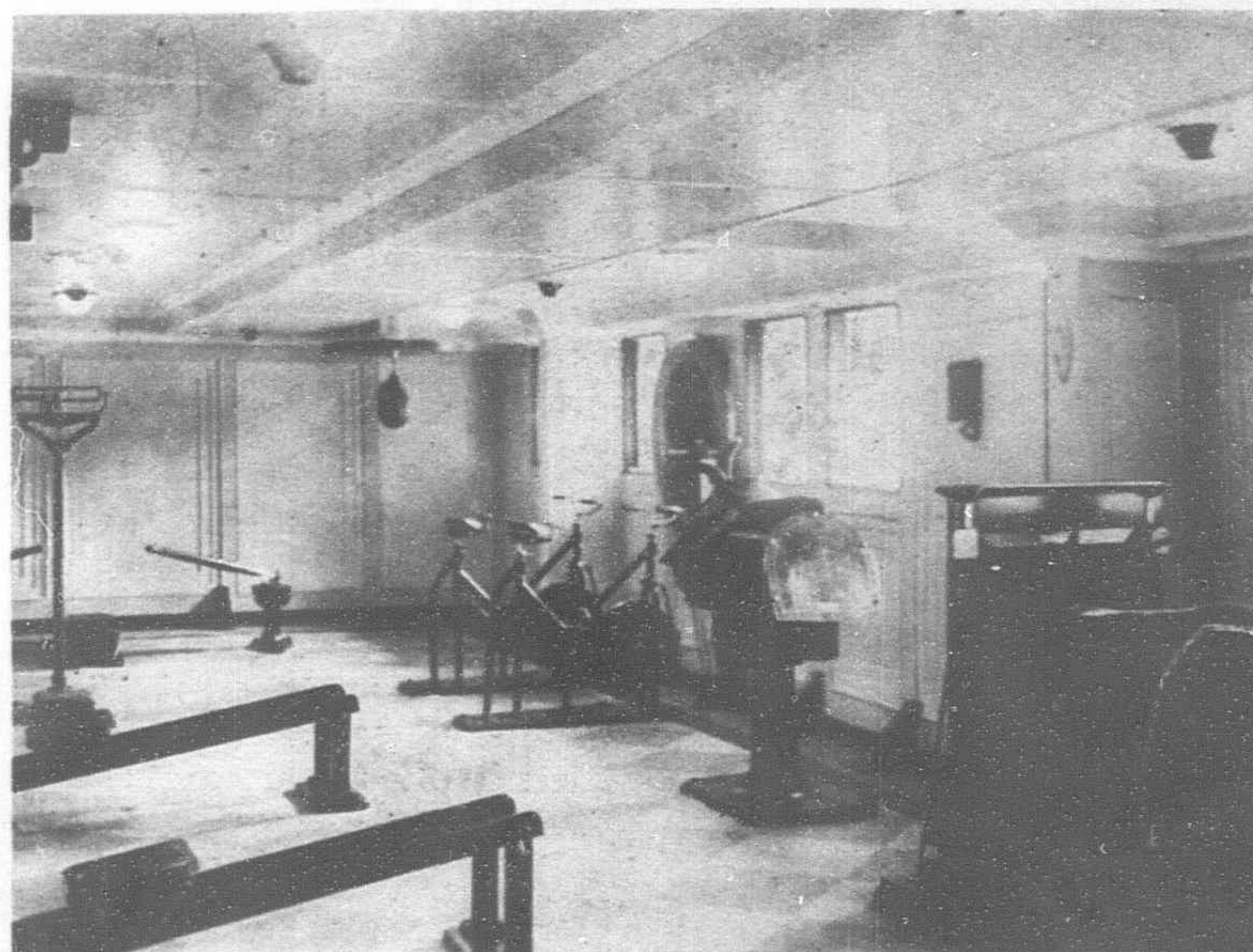
Reading and Writing Room



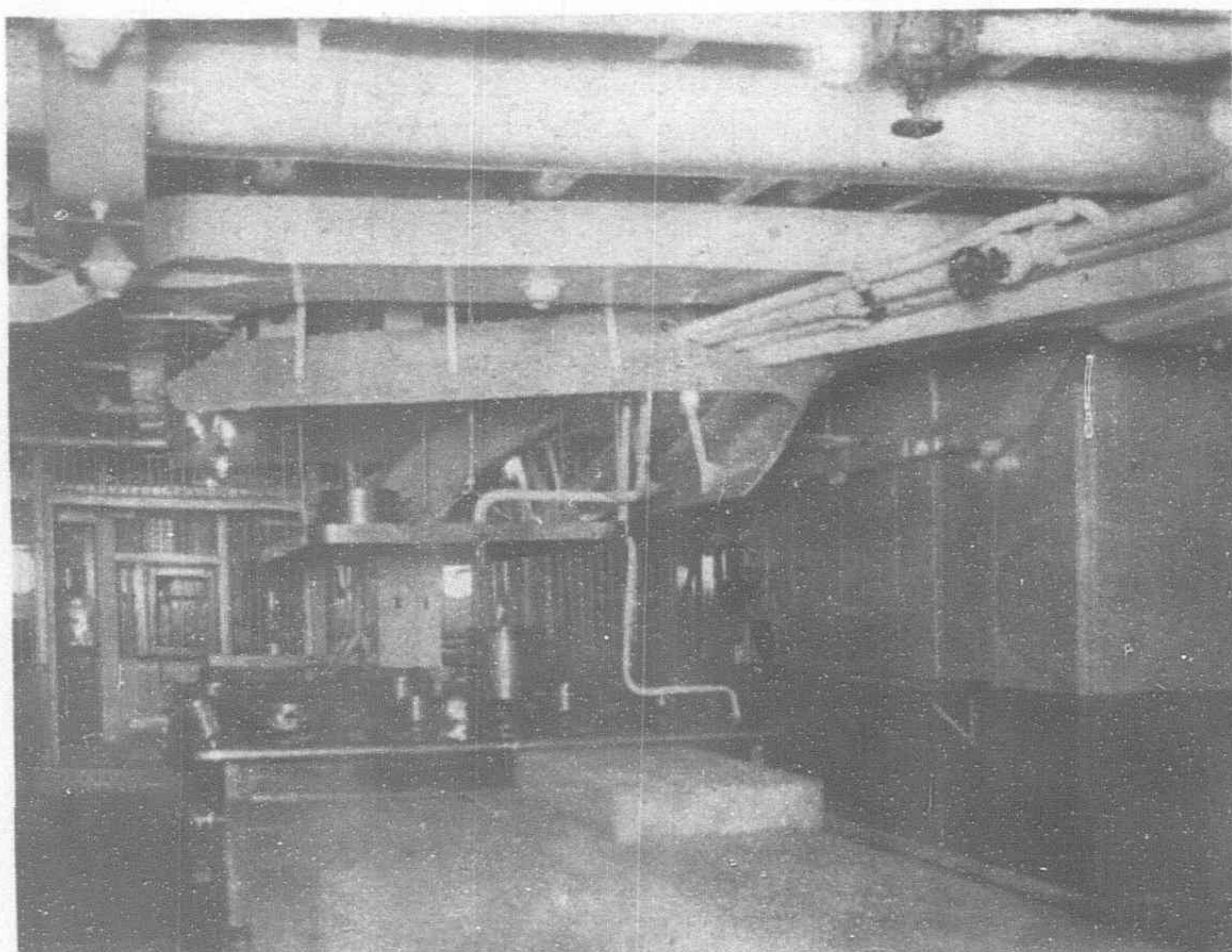
Swimming Pool



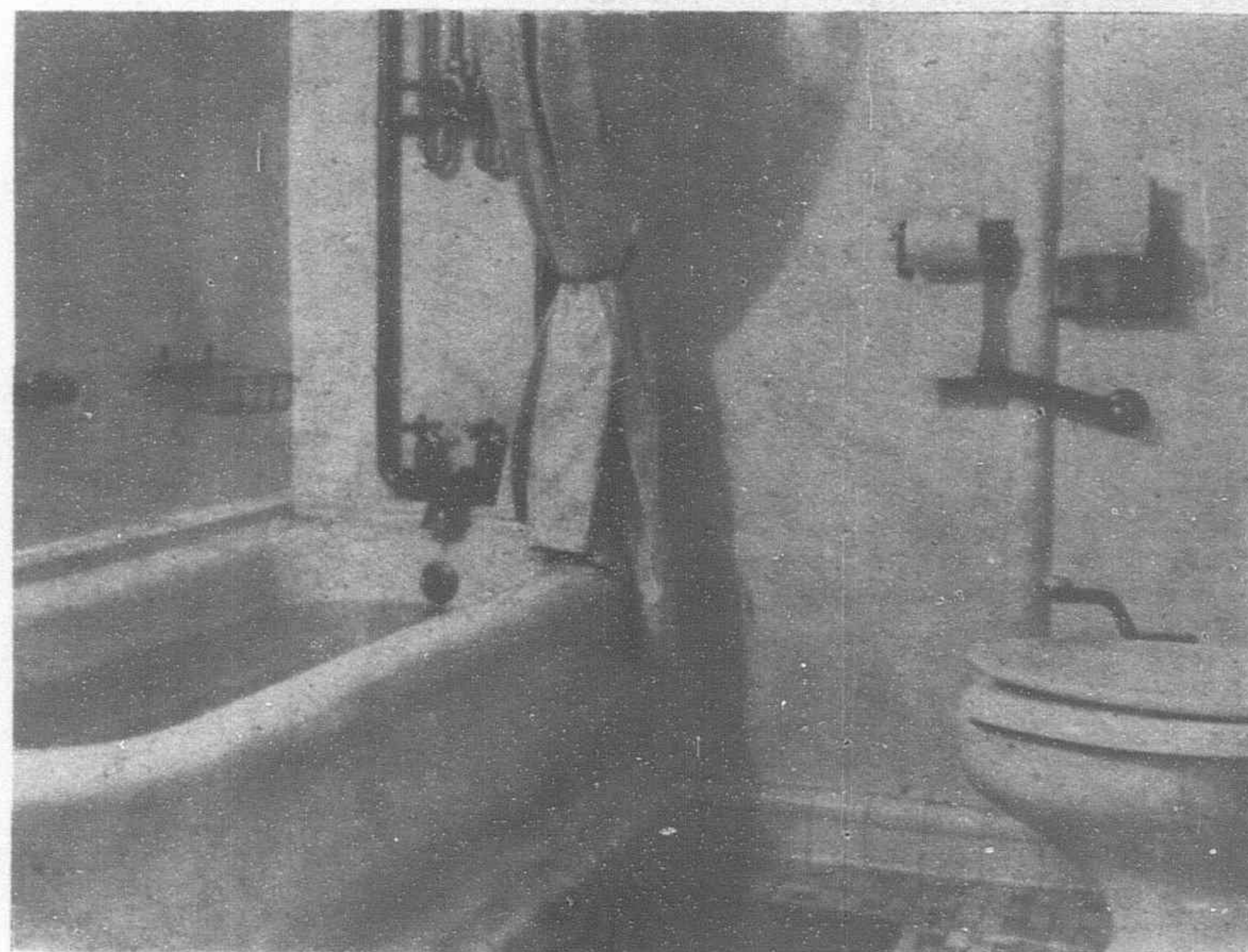
Gallery



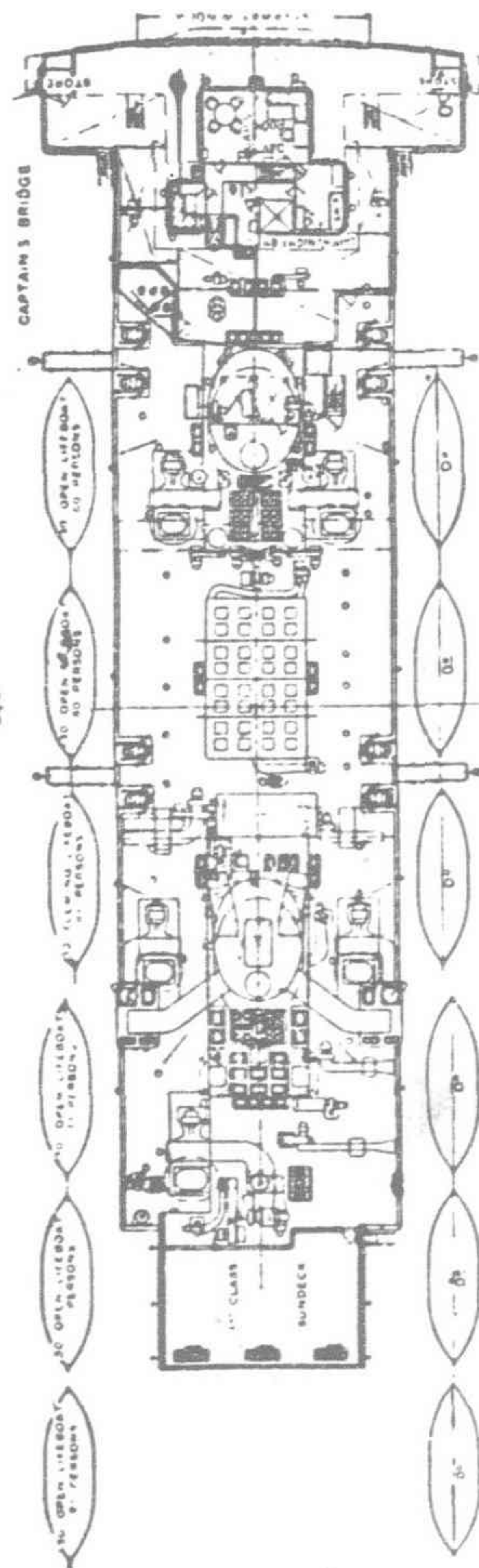
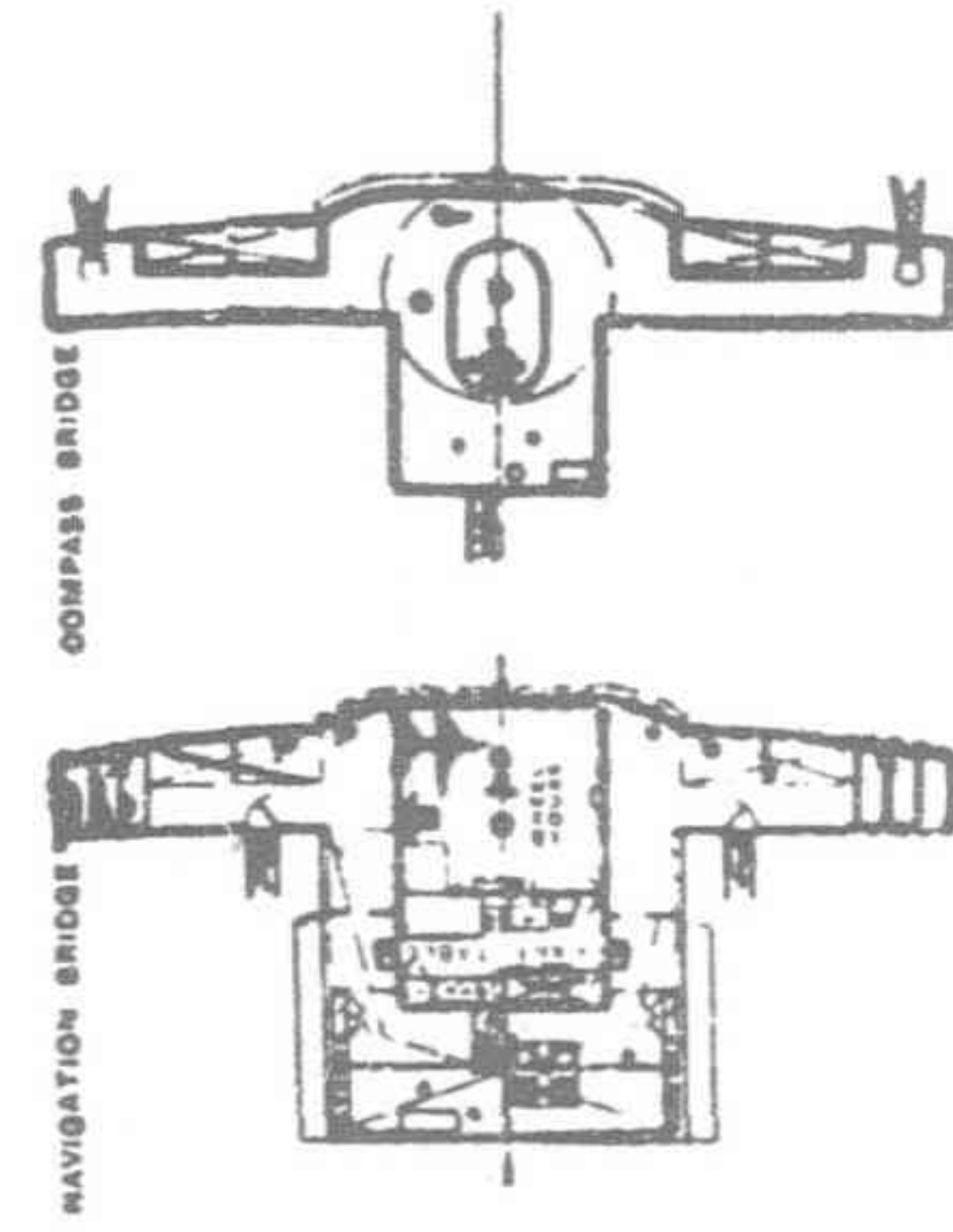
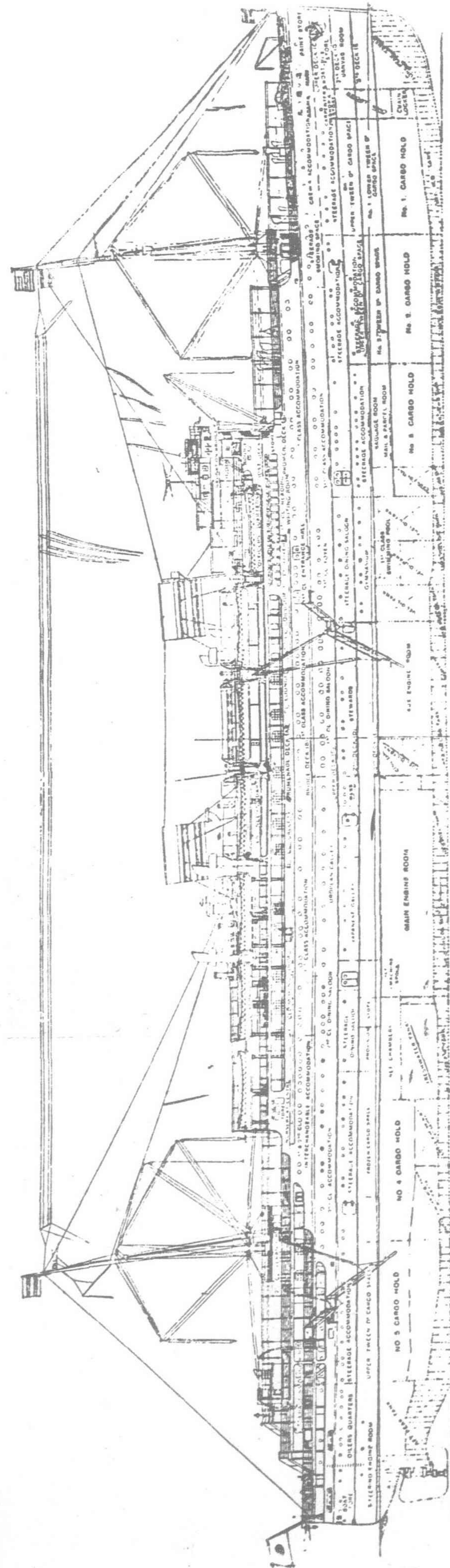
First Class Gymnasium



Galley and Pautry



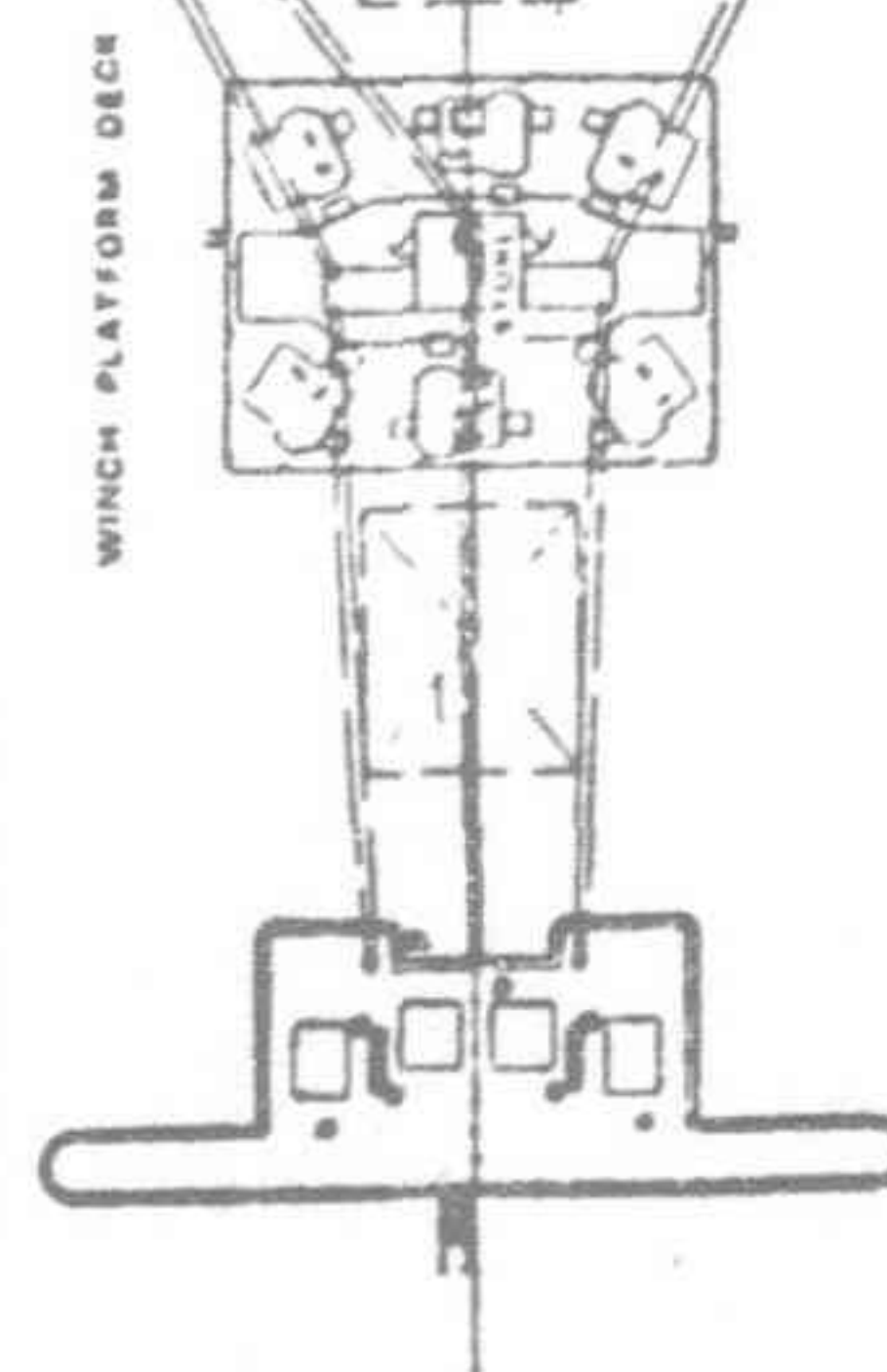
First Class Bath Room



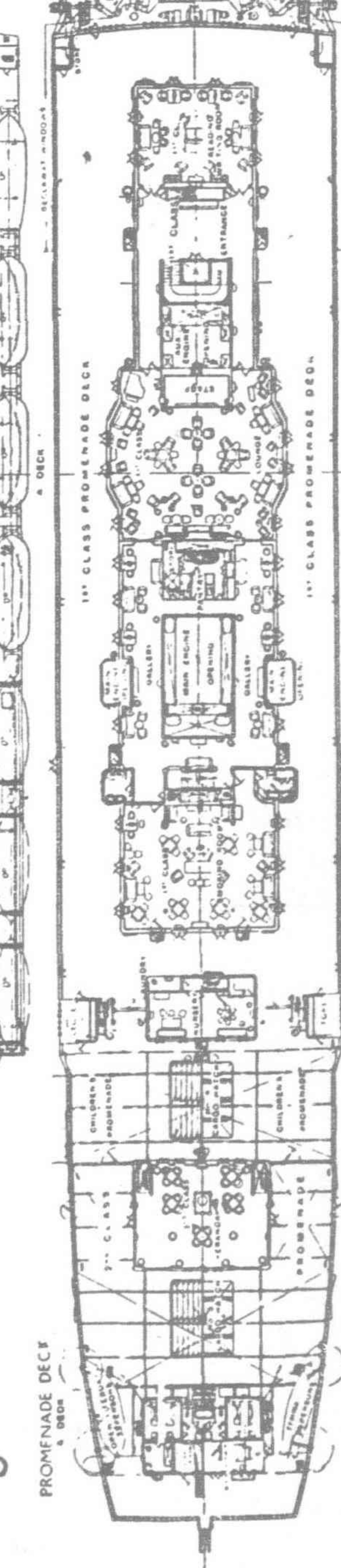
Shipbuilders: Mitsubishi Zosen
Kaisha.
Engine Builders: Sulzer Bros.
Output: 16,000 b.h.p.

Length .. 560 ft. b.p.
Beam .. 72 ft.
Depth .. 42 ft. 6 ins.
Gross Register .. 17,000 tons.

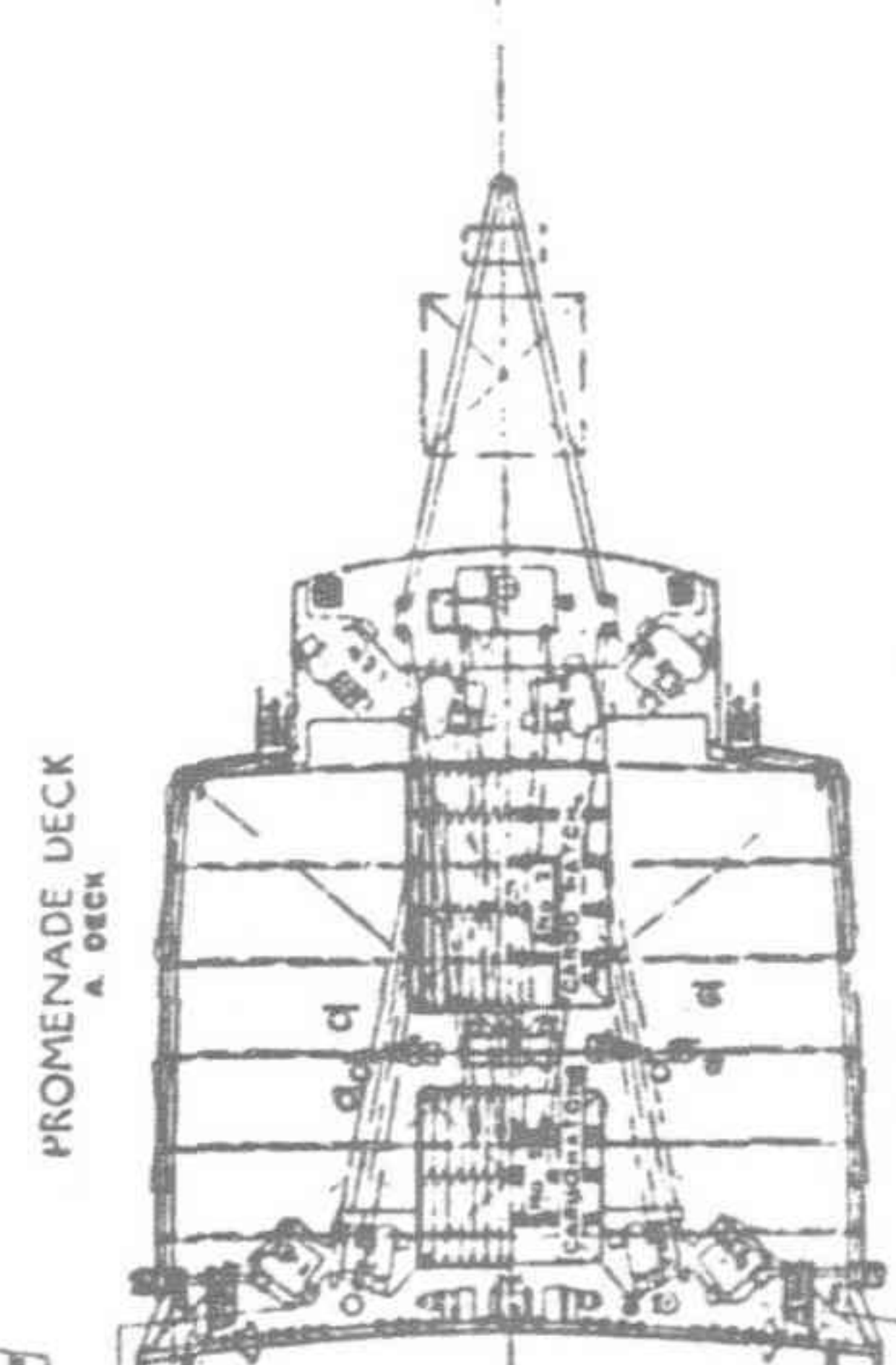
UPPER DOCKING BRIDGE



PROMNAD DECK

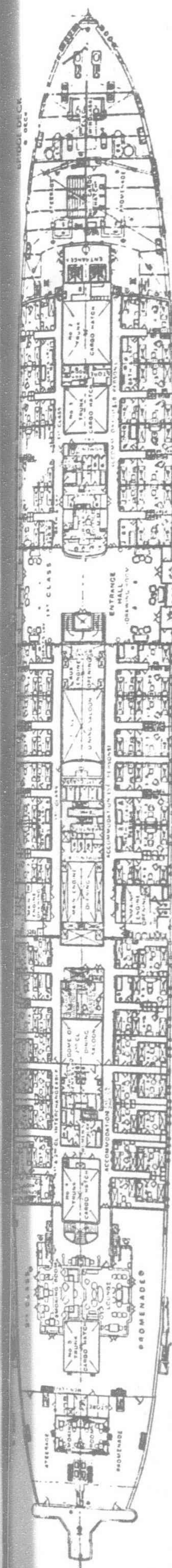


PROMNAD DECK



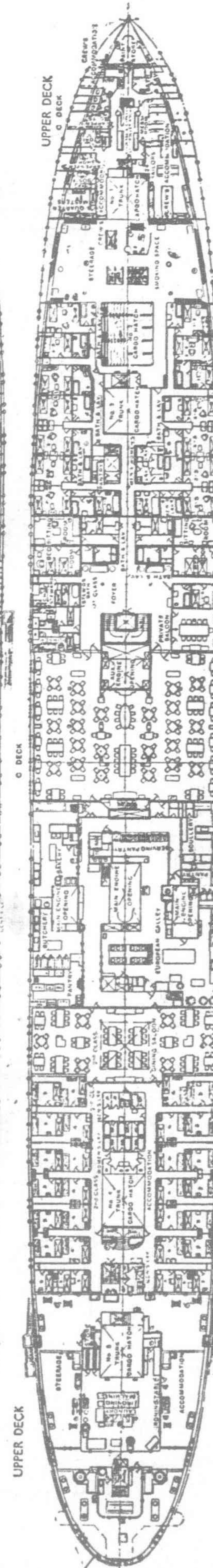
PROMNAD DECK

GENERAL ARRANGEMENT PLANS OF



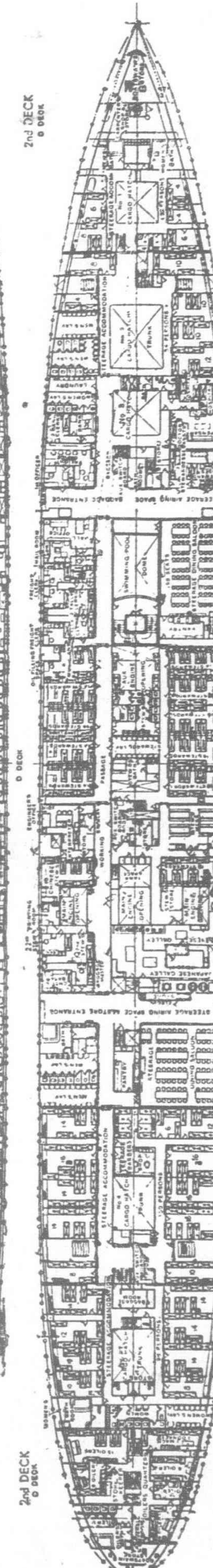
UPPER DECK

UPPER DECK



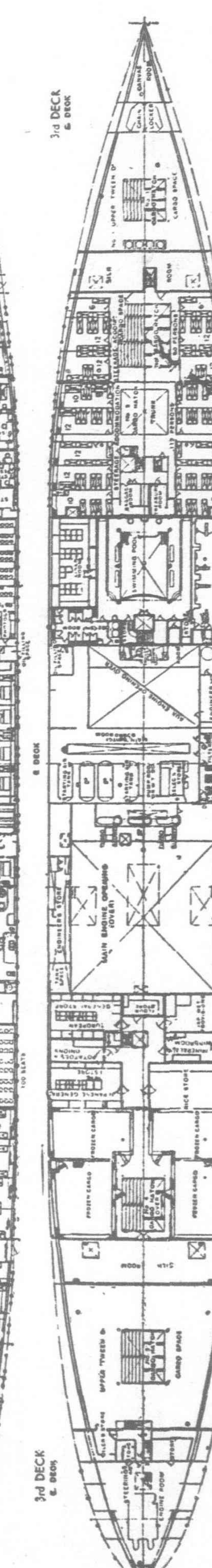
2nd DECK

2nd DECK



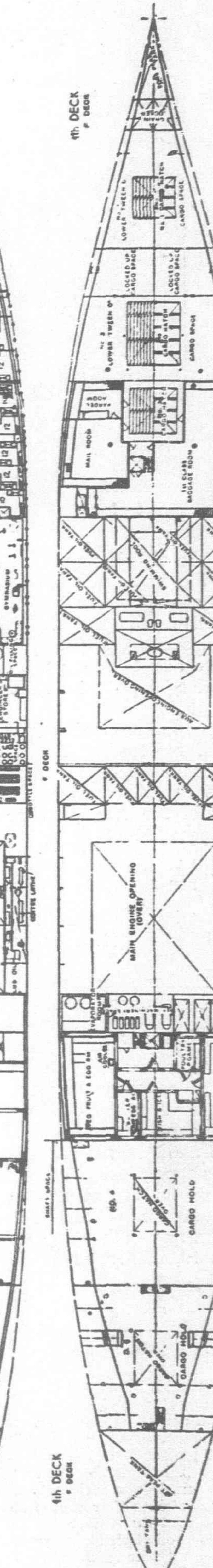
3rd DECK

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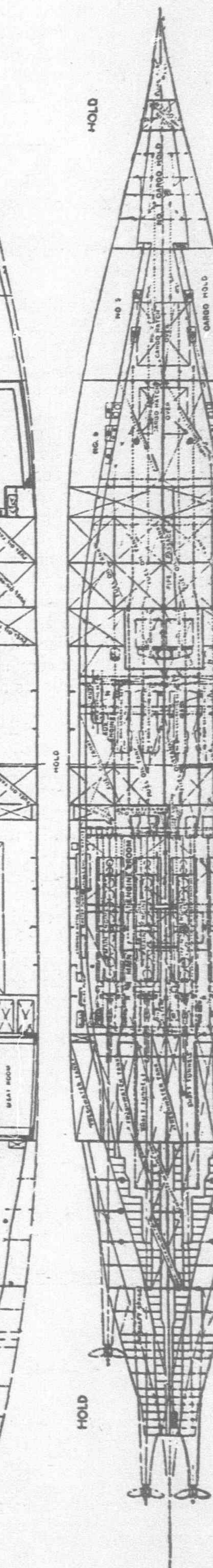
4th DECK

4th DECK



HOLD

HOLD



HOLD

HOLD

THE N.Y.K. LINER "ASAMA MARU"

Steel Works' double-acting CO₂ type, and each has independent circulating pumps. For the cold cupboard in the galley, another brine circulating pump is provided. One machine can keep all the cold stores at the required temperature, even in equatorial regions, by running 12 hours per day, and can also make $\frac{1}{4}$ ton of ice.

Hospitals

Sick bays, isolation rooms, an examination room, a waiting room, a dispensary and operation room, a disinfecting room and a mortuary are arranged. The sick bays are on the second deck starboard adjacent to the dispensary and operating rooms, the doctor's assistant's room, lavatories and a bath being attached for exclusive uses.

Infectious-disease rooms, the disinfecting room and the mortuary are on the stern part of the promenade deck.

The wireless apparatus is of Japanese make and has a short-wave equipment. The transmitters comprise a 2-kW. main transmitter, a $\frac{1}{2}$ -kW. auxiliary transmitter, and a $\frac{1}{4}$ -kW. short-wave transmitter. The receivers are also for long, medium and short waves. The motor lifeboats are equipped with Radio-Communication wireless apparatus.

The aerials are in four lines, the fore-half being for 200-3,000-meter waves, and the aft-half for transmitting 600-2,400-meter waves and for receiving 2,000-20,000-meter waves. Further, there are two lines of aerials for short waves and one for wireless telephony. Band reproducers of the Western type are fitted to all the public rooms and promenades.

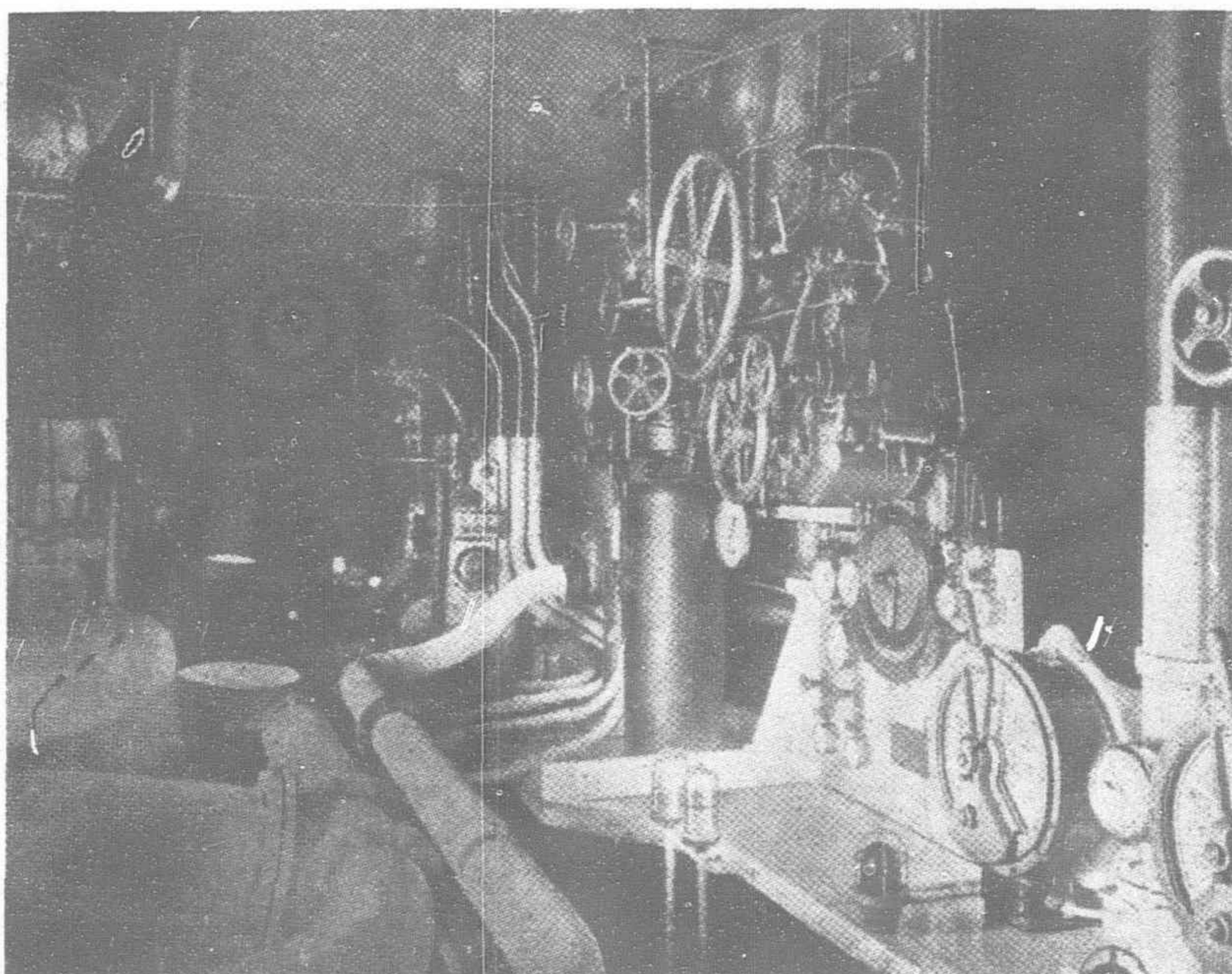
Trials

On the full speed official trials the main engines developed 19,108 s.h.p.; a mean speed of 20.71 knots and a maximum speed of 21.01 knots were recorded.

The fuel consumption on six hours' continuous trials was 172 grams per s.h.p.-hour (0.38 lb.), measured with accurate fuel-oil tanks.

At the full-power 24 hours' continuous trials all engine-room machinery and deck machinery were driven as in ordinary navigating conditions, and tests for dynamo capacity and working conditions of all machinery, for interchanging the turbo-blowers and all pumps for the main engines, also for supplying capacity of injection air, assuming a breakdown of the main engine air compressors, were carried out. All of the results were most satisfactory.

The figures given are those for the averages of the various runs, but, as recorded, a maximum speed of 21.01 knots was attained. The indicated h.p. of the machinery was then 23,985, corresponding to a total shaft horse-power of 19,600 h.p. The average speed for



Control Platform of One of the Four Engines: "Asama Maru"

the propelling motors was then 127.3 r.p.m. This is equivalent to an overload of about 20 per cent., and it was maintained for a period of three hours, with good exhaust. It is of some importance on this run that considerable overloads should be possible in order that time may be made up if lost for any reason during the voyage. On the slow-speed test it was shown that the engines could be run at a speed of 30 r.p.m. consistently and continuously, the ship's speed being then no more than about 5 knots.

During her first run across to San Francisco the *Asama Maru* made a very satisfactory performance, and she arrived at her destination a full day ahead of scheduled time.

The result of the full speed official trial is as follows:

Mean speed	...	...	...	...	20.71 knots
Total i.h.p.	...	...	...	...	23,223
Total s.h.p.	...	...	...	...	19,108
Total generator output	...	...	...	...	1,108 kW.
Turbo-blower input	...	...	...	...	635 kW.
Piston-cooling and seawater pumps	...	...	...	...	134 kW.
Cylinder-cooling pumps	...	...	...	...	56 kW.
Lubricating-oil pumps	...	...	...	...	69 kW.
Dynamo-cooling water pumps	...	...	...	...	14 kW.
Main engine revolutions	...	...	...	...	126 per min.
Scavenging air pressure per sq. cm.	...	...	...	...	0.1107 kg.
Injection air pressure per sq. cm.	...	...	...	...	72.47 kg.
Fuel oil consumption per s.h.p. per hour (for all purposes)	...	...	...	...	190.1 grams or .422 lb.
Sea water temperature in C°.	...	...	...	...	29.6

M.S. "Tatsuta Maru"

The *Tatsuta Maru*, one of the sister ships of the *Asama Maru* designed to run on the same route, was laid down in the Mitsubishi Nagasaki Shipyard on December 3, 1927, and launched on April 12, 1929. The vessel is now fitting out.

Her main propelling machinery was built wholly in the Mitsubishi Nagasaki Works. It was at first intended to manufacture the main engines of the first ship, the *Asama Maru*, in Nagasaki, but from various considerations they were finally ordered from Sulzer Bros.

The *Tatsuta Maru's* 16,000 h.p. Mitsubishi-Sulzer Diesel engines are already completed in the Nagasaki Works, and the shop trial results were very successful. The voyage of the *Tatsuta Maru* will be considered one of the most remarkable events in the history of Japanese shipbuilding, although, at the same time, it should be remarked that whilst the machinery output for the vessel, viz., 16,000 s.h.p., is very much larger than anything which has previously been attempted with engines in Japan, the actual motors are of standard type, and similar units with smaller numbers of cylinders have already been built by Japanese manufacturers.

The Second World Power Conference

Meets in Berlin During June

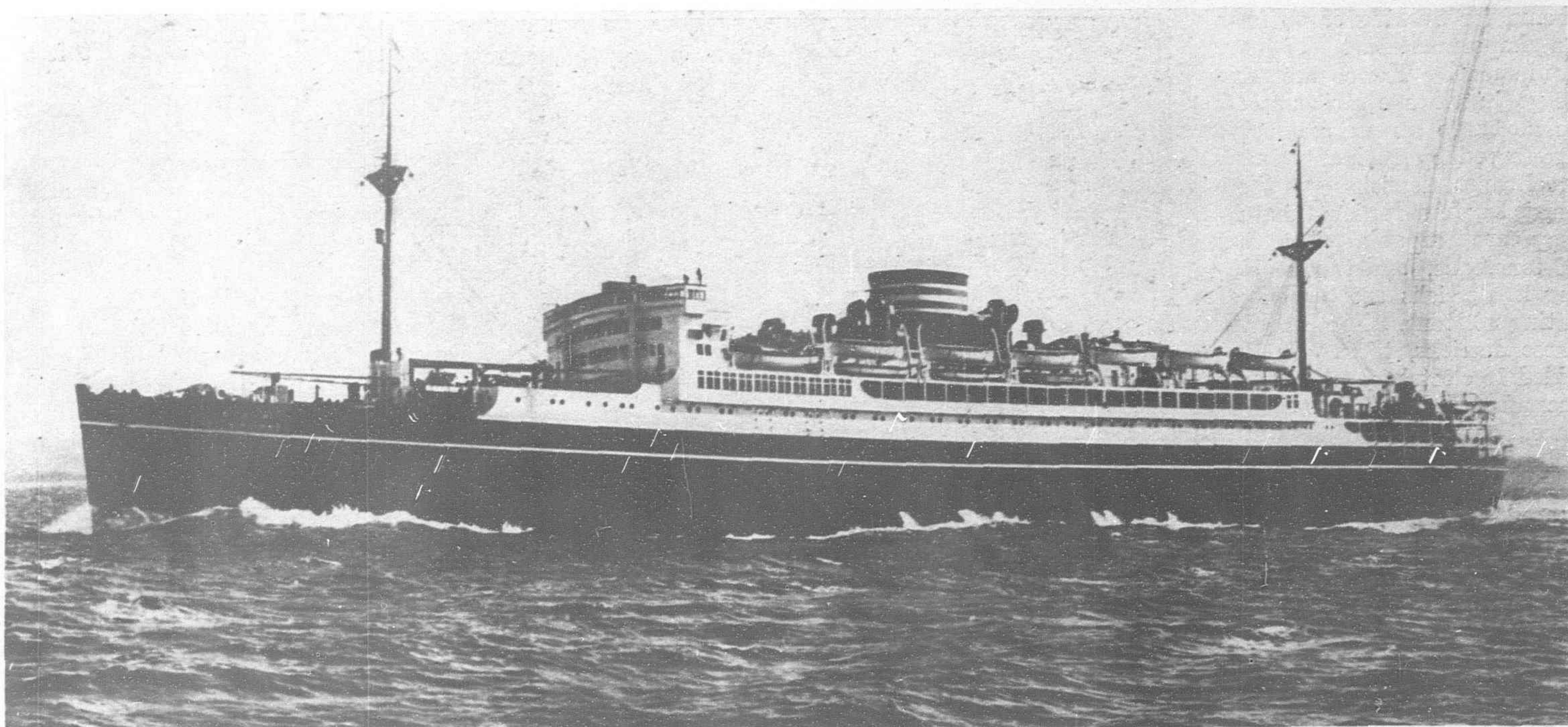
THE prospectus of the Second World Power Conference rightly states that the Conference stands in importance with the diliberation of statesmen, for the lessening of the burden of physical toil and the utilization of power for the benefit of the human race, affects mankind from every standpoint. It is altogether fitting that just as the first conference was held in London, in England where steam was first applied to industrialization, the second should be held in Germany which, despite a frightful war and the terrific costs of reparations, is making colossal strides of progress in every field of engineering and in every use of "the sunlight stored in coal, oil and natural gas."

The Far East will be well represented at this Conference. The Japanese delegation will be particularly large and noteworthy. It will consist of Dr. Baron Chuzaburo Shiba, head of the Institute of Aviation, and member of the House of Peers; Dr. Masao Kamo, president of the Japanese Society of Mechanical Engineers of Tokyo Imperial University, who has been elected

vice-president of the conference at Berlin; Dr. Yoshikiyo Oshima, Dr. Masaharu Goto, Dr. Matujiro Oyama and Dr. Masayoshi Ishikawa, all professors of engineering at Tokyo Imperial University and Dr. Masayoshi Tsutsumi, president of Osaka University of Industry.

The Navy will be represented by Captain Naokuni Nomura and seven other officers, while the Railway Ministry will send several of its most noted engineers. The War Office and Foreign Office are also expected to send representatives to the conference.

Three of the leading Germans in the Conference are well known in the Far East, which they visited during the Tokyo Conferences last Winter. They are Dr. Oskar von Miller, head of the German Museum at Munchen, who is honorary president of the Berlin conference; Dr. Carl Koettgen, director of the R. K. W., who is president of the conference, and Dr. Conrad Matchoss, director of the German Engineering Society, who is general secretary.



The "Chichibu Maru," a Luxurious Passenger-Carrying Burmeister Diesel-engined 17,000 Ton Liner of the N.Y.K. Line, Which will begin its Service on the San Francisco Line in April, 1930. Built by the Yokohama Dockyard Company

NEW N.Y.K. DE LUXE MOTOR PASSENGER VESSEL

"CHICHIBU MARU"

Gross Tonnage 17,500 Tons

THE *Chichibu Maru*, built for the Orient-California Service of the Nippon Yusen Kaisha by the Yokohama Dock Co., Ltd., Yokohama, is the second of three similar vessels to be completed. She is two feet wider in beam than the *Asama Maru*, which has just completed her round maiden voyage and has shown very successful results. Her keel was laid down on the 6th February, 1928, and she was launched on the 8th May, 1929.

The leading particulars of the *Chichibu Maru* are as follows:—

Length overall.	583 ft. 3 in.
Length B. P.	560 ft. 0 in.
Breadth moulded.	74 ft. 0 in.
Depth moulded.	42 ft. 6 in.
Gross tonnage.	17,000 tons.

The external features of the vessel include a raked straight stem, cruiser stern, large superstructures, two pole masts and one large funnel, giving the vessel a handsome and graceful appearance.

The ship has in all seven decks designated the boat, promenade, bridge, upper, second, third, and fourth deck respectively.

The ship has been constructed and equipped under Teishinsho Special Survey, in accordance with the Shipbuilding

Rule, Ship Inspection Law, Ship Load-Line Law, and also with the requirements of the highest class of Lloyd's Registry under their Special Survey—class 100 A1 with Freeboard.

The vessel has a continuous cellular double bottom and is subdivided by 10 watertight transverse bulkheads extending to the upper deck and so arranged that the ship would remain afloat with any two adjacent compartment open to the sea, in other words the ship is subdivided in a two compartment system in accordance with the new International Convention.

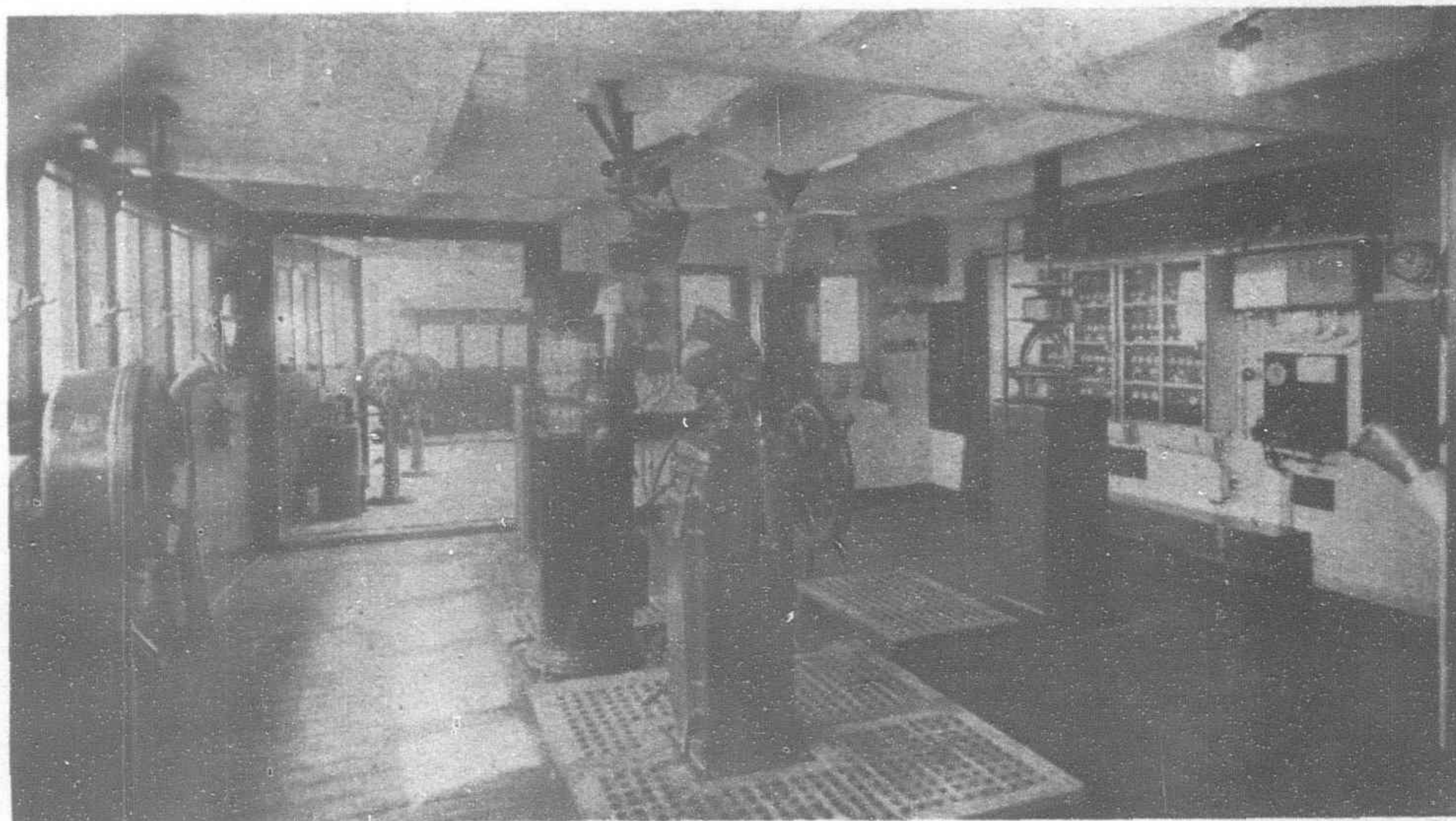
Above the upper deck, fireproof bulkheads are arranged also in accordance with the requirements of the new Convention, suitably sectionalizing the upper portion of the ship so that any outbreak of fire would be localized.

The constructors' precaution against the ship's vibration and

regarding the insulation of noise in engine-room are expected to be satisfactory as in the case of the *Asama Maru*, and it is believed that these facts will increase for the passengers the comfort derived from the most luxurious passenger accommodation to be described.

Equipment

As the vessel, besides her passenger-functions, is designed to carry considerable quantities of cargo in the lower holds and 'tween decks, the arrange-

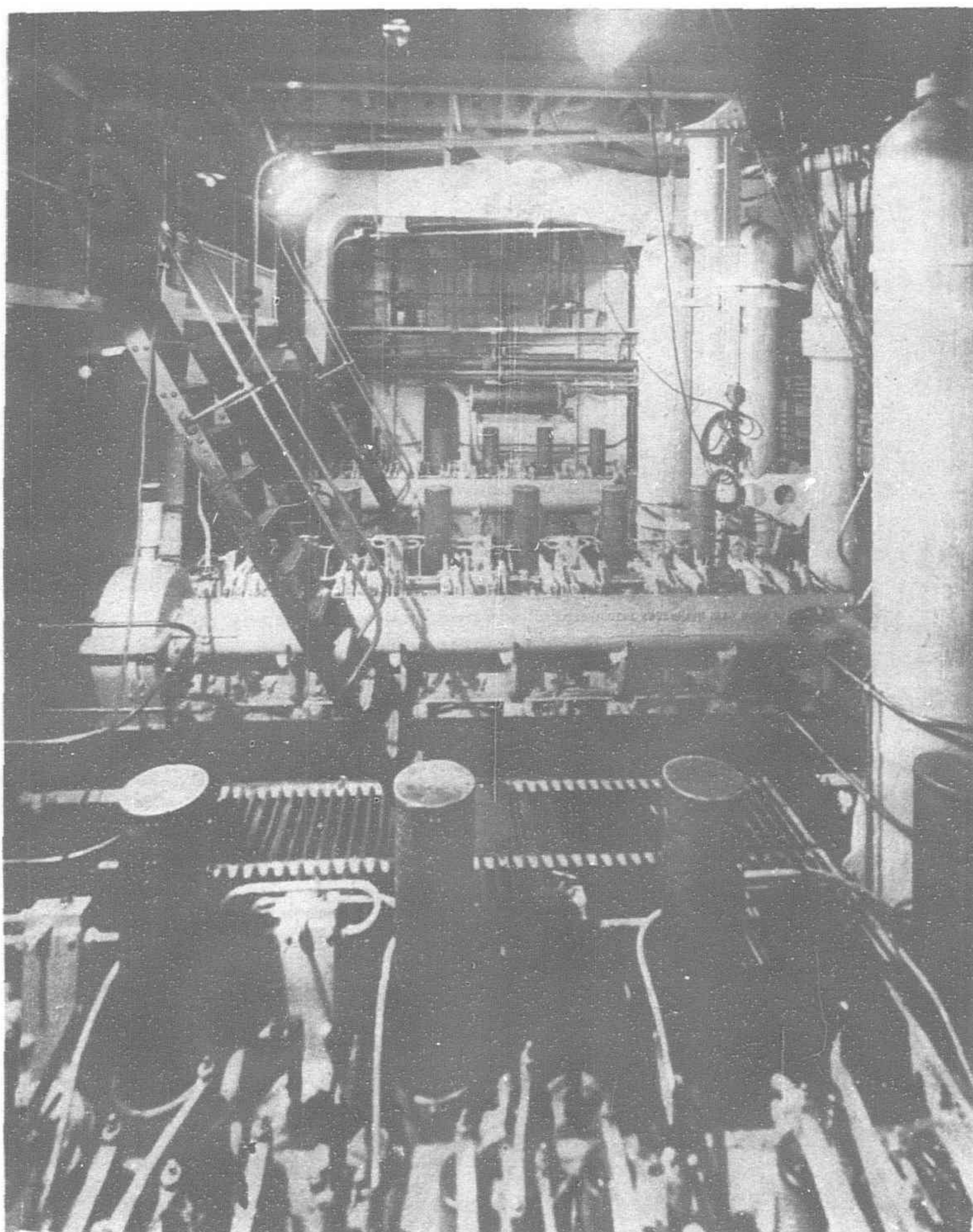


Navigating Bridge, "Chichibu Maru"

ments for working cargo form an important part of her equipment. There are five cargo hatchways giving access to the cargo spaces, and these are served by 16 Mannesmans steel cargo derricks. Of these derricks, four for No. 2 hatchway are capable of lifting 10-ton loads, and the remaining 12 derricks are capable of lifting 6 tons. For working these derricks, there are provided 16 electric cargo winches manufactured by Messrs. Laurence, Scott & Co., of England. All these winches are the makers' latest standard, worm-gear, electric cargo winches of a silent-running type, eminently suitable for passenger ships, obviating, as they do, the disturbance of passengers, 12 out of 16 are capable of lifting a load of 5 tons at a speed of 130 feet per minute, and the remaining 4 are capable of lifting a load of 3 tons at a speed of 100 feet per minute, all having very quick speed at light and medium load.

An electric windlass manufactured by Messrs. J. H. Wilson & Co. of England is arranged on the bridge deck forward. The windlass is capable of exerting a pull, at the lifters, of 28 tons at 32 feet per minute. All electric parts are also Messrs. Laurence, Scott & Co.'s make, capable of developing 140 B.H.P. at 500 R.P.M.

There are also, for warping purposes, two electrically driven capstans on the bridge deck forward and two on the upper deck



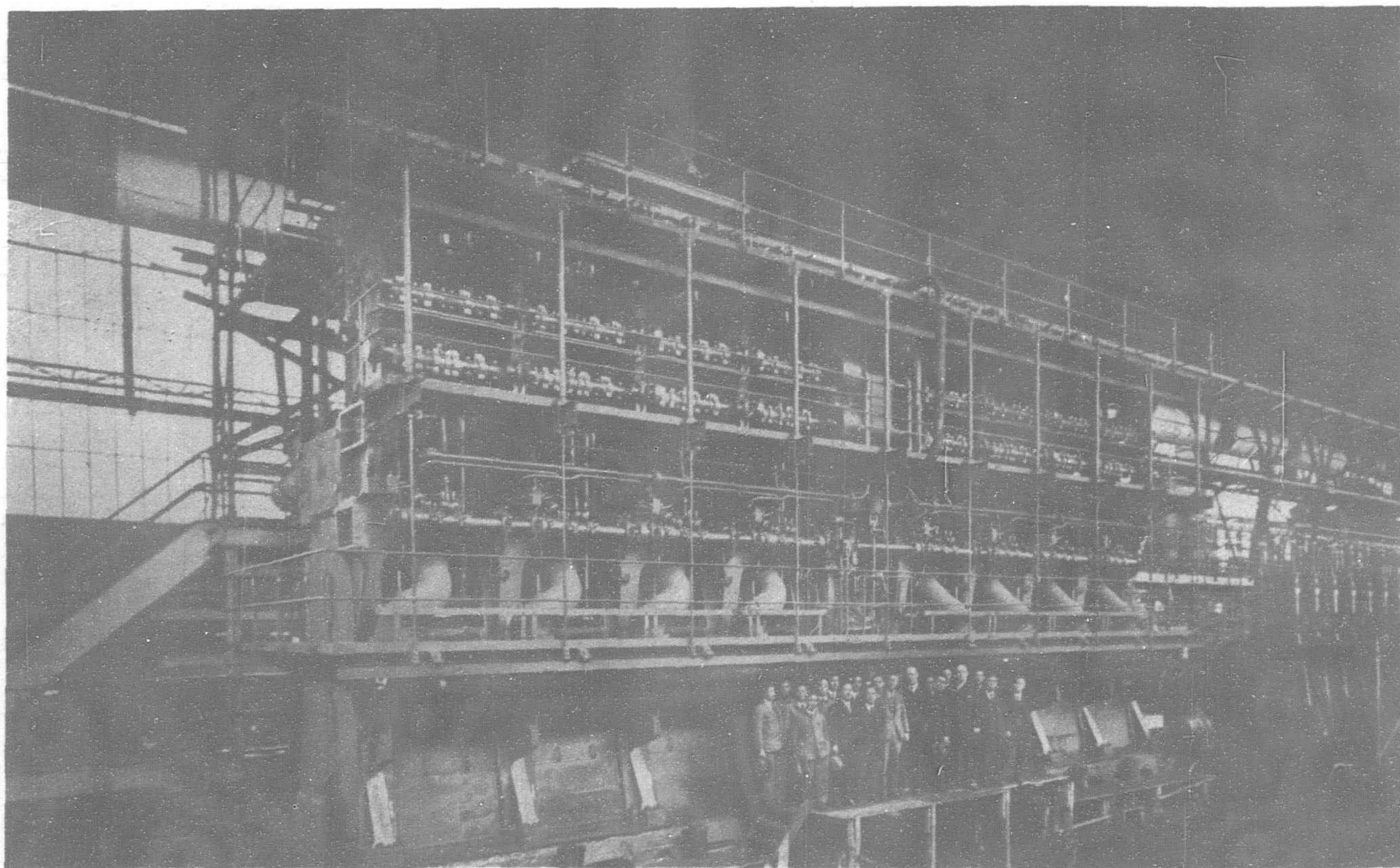
Top View of Engines

side of the main engine-room. The plant includes two electrically-driven compressor engines and the necessary evaporators, brine pumps and other auxiliaries. The insulated cargo spaces are divided into four compartments, and provision is so made as to

aft, each capable of exerting a pull of 15 tons at 100 feet per minute with motor of 145 B.H.P. In addition to these, there are also two capstans of smaller type arranged on the upper deck aft, capable of exerting a pull of 5 tons at 150 feet per minute with a motor of 75 B.H.P., all the above capstans having been supplied by Messrs. Napier Brothers, Ltd., Glasgow.

The steering gear has been supplied by Messrs. John Hastie & Co., Ltd., of Greenock. It is of the electro-hydraulic type in duplicate, each gear consisting of two hydraulic rams and a variable-stroke hydraulic pump driven by an electric motor of 55 B.H.P. Control from the navigating bridge is effected by a telemotor of Mactaggart, Scott & Co., Ltd., and also by Sperry's magnetic clutch type, two-unit gyro pilot. The gear is also mechanically controlled from the steering standard on the docking bridge as usual.

The two sets of Seager's multiple effect CO₂ refrigerating machinery to deal with the refrigerated cargo and cold store, have been supplied by Messrs. Kobe Steel Works, Kobe, Japan, and are placed at the 4th deck level on the port



Engines on Test Bed at Burmeister & Wain Works, Copenhagen

keep each individual compartment at the various desired temperatures, and the plant is capable of keeping the whole of the refrigerated cargo spaces as low as 15° F., while the whole cold provision store, cold cupboard and cooled water tanks in galleys and pantries are kept at the necessary low temperature. For the use of the cold cupboard and soda fountain in the first class smoking-room bar on the boat deck, small independent refrigerating machinery of "Frigidaire" is installed.

The equipment of Life-saving appliances embodies a number of noteworthy features and conforms with the elaborate requirements of Teishinsho, British Board of Trade and Bureau of Navigation of the U.S.A. for passenger and emigrant vessels. Altogether there are 22 boats of various types and sizes having a capacity sufficient to accommodate all passengers and crew on board. Two of the boats are motor-driven, each equipped with a Parsons motor, 28-32 B.H.P., a wireless installation and a searchlight, and another two of the boats are equipped with Fleming's manual propelling gear, by which even lady passengers can propel the boat, by merely reciprocating the levers which rotate the propeller through the propeller shaft.

The boat-launching appliances have been supplied by Messrs. Welin-Maclachlan Davits, Ltd. and are capable of placing all the lifeboats in the water in a few minutes. There are six sets of gravity type davits operating large single lifeboats with a capacity for 70 persons each, and eight sets of Welin's quadrant davits, two of which operate motor-boats with a capacity for 50 persons each, and six of which operate a large lifeboat with a capacity for 60 as well as a collapsible, decked lifeboat stowed underneath, with capacity for 69. In addition to the above, there are one lifeboat and a *Temma* arranged on the aft boat deck under ordinary davits.

There are six sets of boat winches attached to gravity davits and eight sets of Welin Grade VII boat winches dealing with boats under quadrant davits, all through wire falls ensuring rapid and reliable lowering of the lifeboats to the water. Robinson's patent (water-borne) boat-releasing gear is also adopted, in order to prevent unsafe releasing before the boat is completely water-borne.

Especially noteworthy is the elaborate equipment of fire-detecting and extinguishing appliances, these include Rich-Lux fire-detecting and extinguishing system of Walter Kidde & Co., U.S.A., Derby's automatic fire alarm, complete hydrant arrangement and usual hand chemical extinguishers. Fire foam plants by Foamite Firefoam, Ltd. of London are provided, as well as the Lux CO₂ system in the machinery compartments. In the Rich-Lux system, smoke accumulators are fitted in cargo or store compartments, and these are connected by steel tubes to a detector cabinet in the wheel-house, so that an outbreak of fire in any compartment may be soon detected by the officer on watch; then the officer has only to run to the CO₂ valve manifold arranged at a very easily accessible place in the 'tween deck and to open the valve; the compartment is then soon filled with CO₂ gas which extinguishes the fire. CO₂ gas is supplied from bottles arranged in a special compartment near the engine-room.

The Derby automatic, electric fire alarm system has been installed to protect all public rooms, staterooms, officers' cabins and crew's quarters. One or more Derby sentinel thermostats are fitted in each compartment, and the whole sentinel thermostats are grouped into a number of convenient circuits to facilitate discovery of the sentinel affected, should the alarm in the wheel-house ring, an alarm gong having been fitted in both wheel-house and engine-room.

In other respects every attention has been given to safety appliances throughout the vessel; for instance, Stone's system of watertight doors hydraulically controlled from the bridge in case of emergency; very complete wireless installation and searchlights on top of the navigation bridge etc.

The ventilation of the vessel, both natural and mechanical, has received very careful consideration. The mechanical ventilation throughout, including the engine-rooms, is carried out by an installation of over 60 fans of various capacity supplied by the Thermotank Co. of Glasgow. The patent "Punkah Louvre" system has been adopted for supplying air to all the passenger accommodation and crew's accommodation amidships. The adoption of the "Punkah Louvre" has eliminated the necessity of electric fans, which only stir up the air in the rooms, whereas the former brings in fresh air through trunkings. The exhaust from accommodation is also effected by mechanical means, and attention has been given especially to the change of air in the galleys, pantries and lavatories.

Thermotank hot air trunkings are provided in parallel use with "Morganite" electric heaters or steam radiators for heating all the first class public rooms, while the individual first and second class staterooms have been fitted with electric radiators supplied by Messrs. Mitsubishi Denki Co., Ltd. Steam radiators have been provided throughout the accommodation of third class passenger and crew's quarters and also in the passage ways in the first and second class accommodation.

Among the notable equipments, there are a Sperry master gyro compass MKVIII, steering and bearing repeaters, a Sperry continuous course recorder and a Sperry two-unit gyro-pilot for automatic steering, the hydro-electric "Sal" log, a combined speed indicator and distance recorder working in parallel with Walker's electric log, complete set of Kolster's Direction Finder, Chadburn's clear view screens, Range Finder of Nihon Kogaku Kogyo Co., Ltd., very complicated electric telegraph and loud-speaking telephones supplied by Messrs. Gelap, Langevin's Ultra-audible sounding machine, Kelvin's latest motor-driven sounding machines, Gelap's Helm Indicators, electrically-operated clocks, Evershed & Co.'s engine revolution indicators, and "Teledep" pneumatic draught gauge of Dobbie, McInnes of Glasgow.

THE PROPELLING MACHINERY.—The main engine consists of two sets of 4-cycle, air-injection, double-acting, heavy oil engines of the well-known B. & W. type, built at Copenhagen in Denmark, and they are installed by the shipbuilders in the after room of the two engine-rooms. Each engine has 8 cylinders 840 mm. in diameter and 1,500 mm. in stroke and rated at 8,000 B. H. P. at 105 R. P. M.

The main motors, in general, do not depart from the maker's 8840-D type well tried on board the latest several motor passenger vessels, and with the latest improvements to eliminate the several detailed defects, which has been found in the ships already in service.

DIESEL COMPRESSORS AND GENERATORS.—As the main motors are exclusively for propelling the vessel and not for driving auxiliaries, there are three independent air compressors in the fore engine-room for supplying blast and starting air to the main engines. These compressors are of the three-stage duplex type, the capacity of each set being sufficient to furnish the blast air for one main-motor, so that one of the three sets constitutes a stand-by.

The compressors are directly coupled to B. & W. 4-cycle, single-acting, 4-cylinder Diesel engines, 4150-M. each developing 850 B. H. P. at 160 R. P. M. Besides these compressors, there are also three main Diesel generators in the fore engine-room. The engines are of 6-cylinder, B. & W. standard single-acting, air-trunk type, 660-MF, developing 600 B. H. P. and 250 R. P. M. with cylinder dimensions of 400 mm. × 600 mm. The generators coupled to these engines are of the multipolar, compound, interpole type, capable of giving a steady output of 400 kW. at 225 volts, and were made by Messrs. W. H. Allen, Sons and Co., Ltd., Bedford, England, based on the British Standard Specifications. On these Diesel dynamos Siemens pyrometers are fitted for measuring the temperature of exhaust gas and that of jacket cooling water, thus ensuring perfect and efficient operation.

There is an additional auxiliary Diesel generator made by Messrs. Niigata Iron Works near Tykyo; it is of 4-cycle, single-acting, air-injection trunk type with 6 cylinders, 9-in. dia. by 12-in. stroke, capable of developing a rated output of 150 B. H. P. at 350 R. P. M. The generator coupled to this is of a D. C. compound-wound type made by Messrs. Mitsubishi Denki Kaisha, having a rated capacity of 100 kW. at 225 volts. For keeping the blast air pressure constant at various loads, an electric blast air controller of the maker's pattern is fitted.

Although the total capacity of the main and auxiliary generators amounts to 1,300 kW., the electric capacity required for the numerous auxiliary motors on decks and in engine-rooms and also for lighting, heating etc., is generated by only two main generators at ordinary sea conditions.

EMERGENCY GENERATOR.—On the boat deck an emergency generating set is arranged, comprising one kerosene engine of 80 B. H. P. manufactured by Messrs. Ikegai Tekkosho, Tokyo, coupled with a 40kW. D. C. generator of Messrs. Mitsubishi Denki Co. The capacity is sufficient to deal with all the emergency lights, such as navigation lights, illumination of boat stations, searchlight projectors, Morse lamps, a certain number of lamps in passengers and crew's quarters and in the machinery space, as well as working the emergency bilge pump and watertight door power pump.

PUMPS IN MAIN ENGINE-ROOM.—The pumps dealing with the main engines are all arranged at the sides of the after engine-

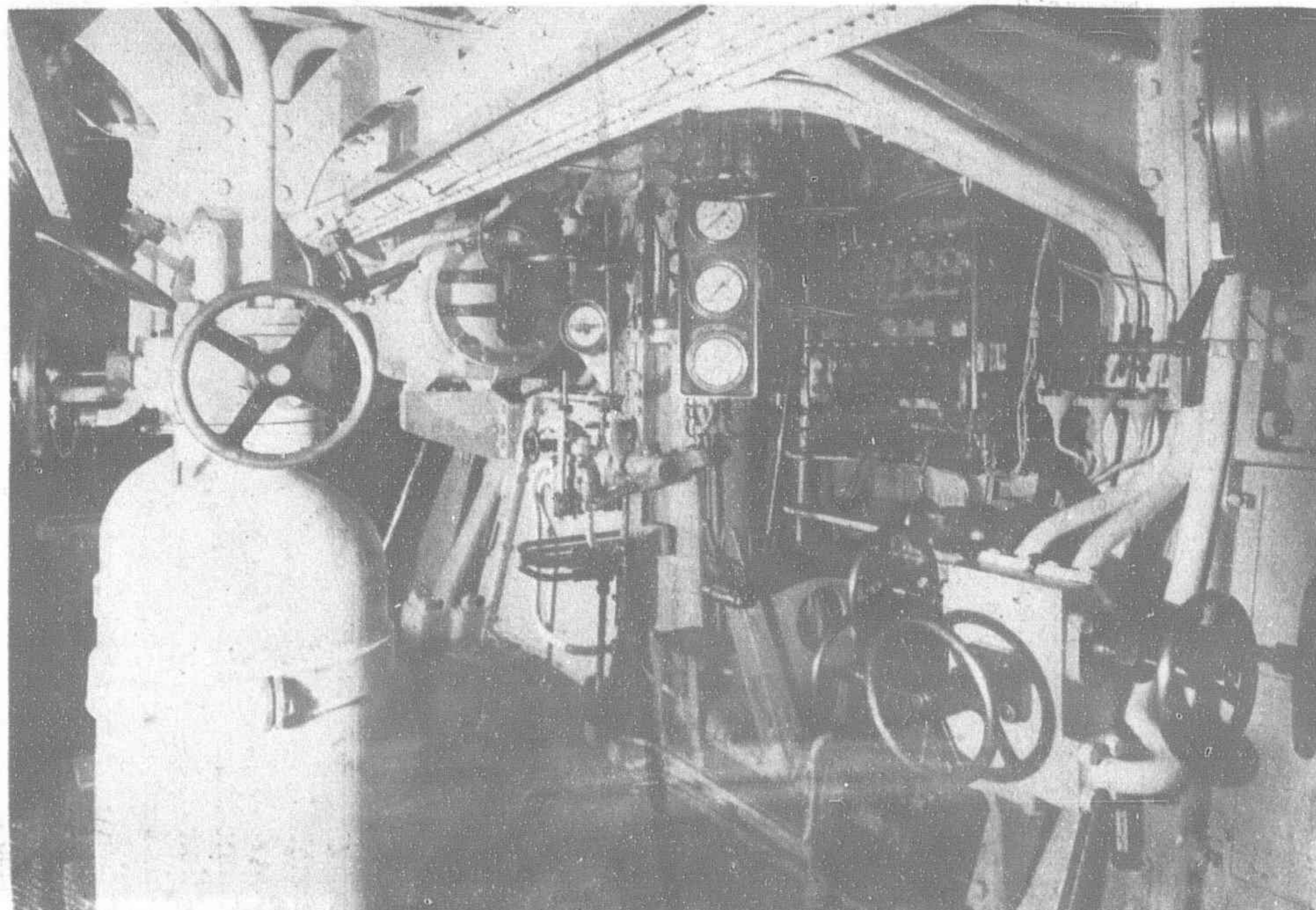
MAIN ENGINE ROOM OF THE N.Y.K. NEW MOTOR SHIP "CHICHIBU MARU"



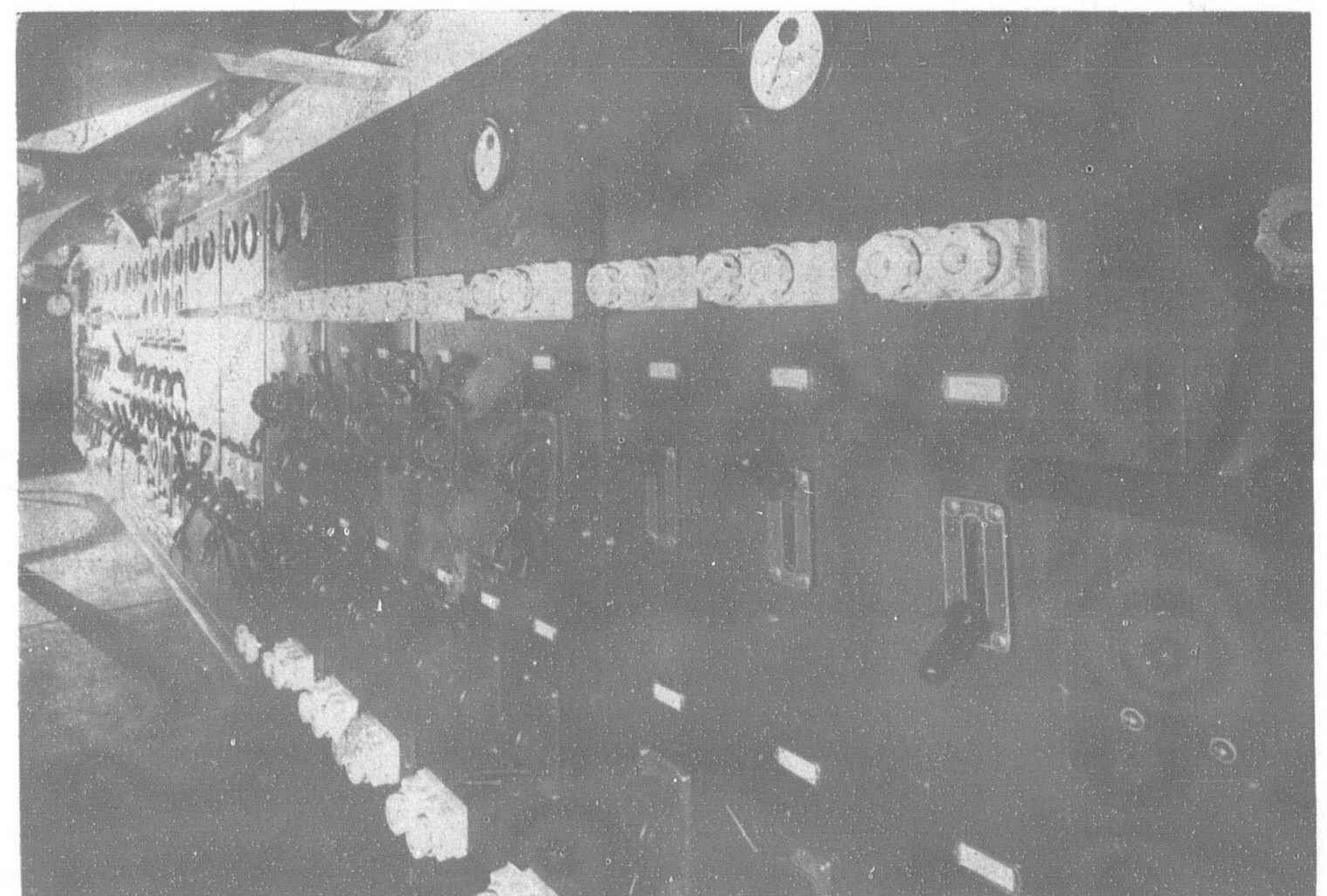
Main Engine Room, Upper View



Maneuvering Platform



Standard Main Engine: Maneuvering Platform



Main Switchboard

room. For each set of main engines there are two complete sets of pumps consisting of sea water circulating pump for cooling and forced lubricating oil circulating pump. One set only is necessary for each main engine, the remaining one set serving as a stand-by for each set of main engines.

The cooling water pumps are of the horizontal, centrifugal type driven by electric motors, having a capacity of 300 T/H., each sufficient for cooling the exhaust gas manifold as well as the lubricating oil and fresh water coolers.

The jackets and covers of the main engine are cooled by fresh water, one set of fresh water cooling pump of 250 T/H. being fitted on the top of a fresh water cooler of the condenser type.

The forced lubricating oil pumps are of the B. & W. rotary type driven by motor. The pump delivers the lubricating oil through a double strainer and two lubricating oil coolers to the main and thrust bearings of the engine as well as to the pistons through telescopic tubes.

In the main engine-room there are also three fuel oil service pumps and an emergency bilge pump, the former are of B. & W. gear wheel type of capacity 20 T/H. driven by shunt motor, which deal with fuel oil for the engine, the latter pump is of a Drysdale's "Centrex" type, capable of delivering 150 T/H. and driven by totally enclosed, submersible shunt motor, connected with both ordinary and emergency electric circuits.

PUMPS IN AUXILIARY ENGINE-ROOM.—In the auxiliary engine-room there are installed two salt water cooling pumps for Diesel generators and compressors with other numerous ship's auxiliary pumps. The following is a brief description thereof:

- (1) **AUXILIARY COOLING PUMPS.**—Two B. & W. supply centrifugal horizontal pumps of capacity 250 tons per hour, one set sufficient for cooling two Diesel compressors and two Diesel generators and the other set constituting a standby.
- (2) **BALLAST PUMP.**—One set of Weir's duplex pump 10-in. × 11-in., driven by overhead motor with double reduction gearing, capacity being 250 tons per hour at 84 R. P. M.
- (3) **BILGE PUMPS.**—One large pump of Weir's duplex motor driven type having a capacity of 150 T/H. and a small pump of Drysdale's selfpriming "Centrex" type, delivering 30 T/H. at normal revolutions.
- (4) **FUEL OIL TRANSFER PUMP.**—2 sets of B. & W. rotary type driven by motor, with single reduction gear, each having a capacity of 250 T/H. at normal revolutions.
- (5) **FRESH WATER PUMPS.**—Three sets of Drysdale's vertical "Centrex" type of about 60 T/H. at 120-ft. of total head, driven by 17 B. H. P. electric motor, and so arranged that any of these can be used for either cold or hot fresh water service.
- (6) **SALT WATER SANITARY PUMPS.**—Three electrically driven pumps of horizontal, centrifugal type made and supplied by Messrs. W. H. Allen, Sons, and Co., Ltd., each having a capacity of 150 T/H. at 100-ft. of total head. It is one of the special arrangements that the hot cooling water returned from the main and auxiliary engines is utilized for hot salt water sanitary services.
- (7) **FIRE AND WASH DECK PUMPS.**—Two pumps of Allen's two-stage horizontal centrifugal type driven by variable speed motor, each having a capacity of 75 T/H. at 7 atmos. and 150 T/H. at 3.5 atmos. of delivery pressure, serve for fire and wash deck purposes and for the swimming pool.

STEAM PLANTS.—Between the main and auxiliary engine-rooms there is a boiler compartment containing two cylindrical Scotch boilers, of 8-ft. 6-in. in length and 11-ft. 3-in. in diameter, constructed in compliance with Teishinsho's, Lloyd's and American Rules for working pressure of 120 lbs./sq. in., each having 1015 sq. ft. of heating surface for raising the steam necessary for galleys, crew's room heating, laundries, thermotanks, steam driven pumps, whistles and other purposes.

The necessary air for combustion is supplied by ventilating fans on the house top. The oil-burning unit of Y. D. C. White type is arranged in duplicate, self-contained units. One auxiliary, non-vacuum, contraflow condenser circulating pump, driven by steam, and two Weir's duplex feed pumps, are provided for the whole steam and exhaust system.

VENTILATION.—Main and auxiliary engine-rooms are ventilated by five powerful motor fans of A. E. G. make, capable of changing the air in the rooms at the rate of 40 times per hour. For trunking special attention has been paid to preventing the accumulation of combustible oil vapour under the engine-room floor.

OVERHAULING CRANES.—For the easy handling and dismantling of these main engines, one set of four-wheeled travelling cranes electrically controlled is fitted with two 8-ton blocks. Numerous hand chain blocks with trollies are also fitted for the auxiliary Diesel engines etc.

- (1) **LUBRICATING AND FUEL OIL PURIFICATION.**—For the purpose of supplying purified fuel oil continuously to all main and auxiliary engines, three sets of De Laval purifiers are fitted with necessary accessories, while Baltic separators, 8 sets in total, are provided for lubricating oil purification.
- (2) **WASTE OIL TREATMENT.**—For the purpose of keeping the engine-room clean, every drop of oil from the engines, oil pumps, oil tanks, etc., is led to the waste oil tanks fitted under the floor, then separated and utilized for burning to heat the boiler. A bilge water separator made by the Steam Line Co. is fitted on the 3rd deck of the auxiliary engine-room for keeping the discharged bilge water free from oil and also with the object of diminishing the waste oil.
- (3) **TANK GAUGES.**—Pneumacator tank gauges made by Dobbie, McInnes are provided for all fuel oil deep tanks and double bottom tanks.
- (4) **LUBRICATION OF TUNNEL SHAFTS.**—For gravity lubrication of the plunger blocks and trailing blocks, one Y.D.C. rotary pump driven by a belt from an intermediate shaft is fitted for each shaft line.
- (5) **LARGE STOCKS OF SPARE PARTS.**—For main and auxiliary Diesels and all electric parts, a much larger number of spare parts is stocked than has ever been done in the case of any other motor vessel, so that a failure of any part of the engine could be easily remedied.

Passenger Accommodation

As it has been the primary thought of the N.Y.K. Line to make the new ships a comfortable home for their patrons during their ocean travel, the Company has spared no pains to ensure that they shall meet the demands of any modern, critical ocean travellers in respect to the passenger accommodation, cuisine and service.

When the *Asama Maru* first made her appearance on the Pacific, all those who had the opportunity to inspect the ship expressed their unreserved admiration of the vessel particularly of the marvellous beauty of her Public Rooms, which some enthusiastic people claimed excelled those on any trans-Pacific liners now in service.

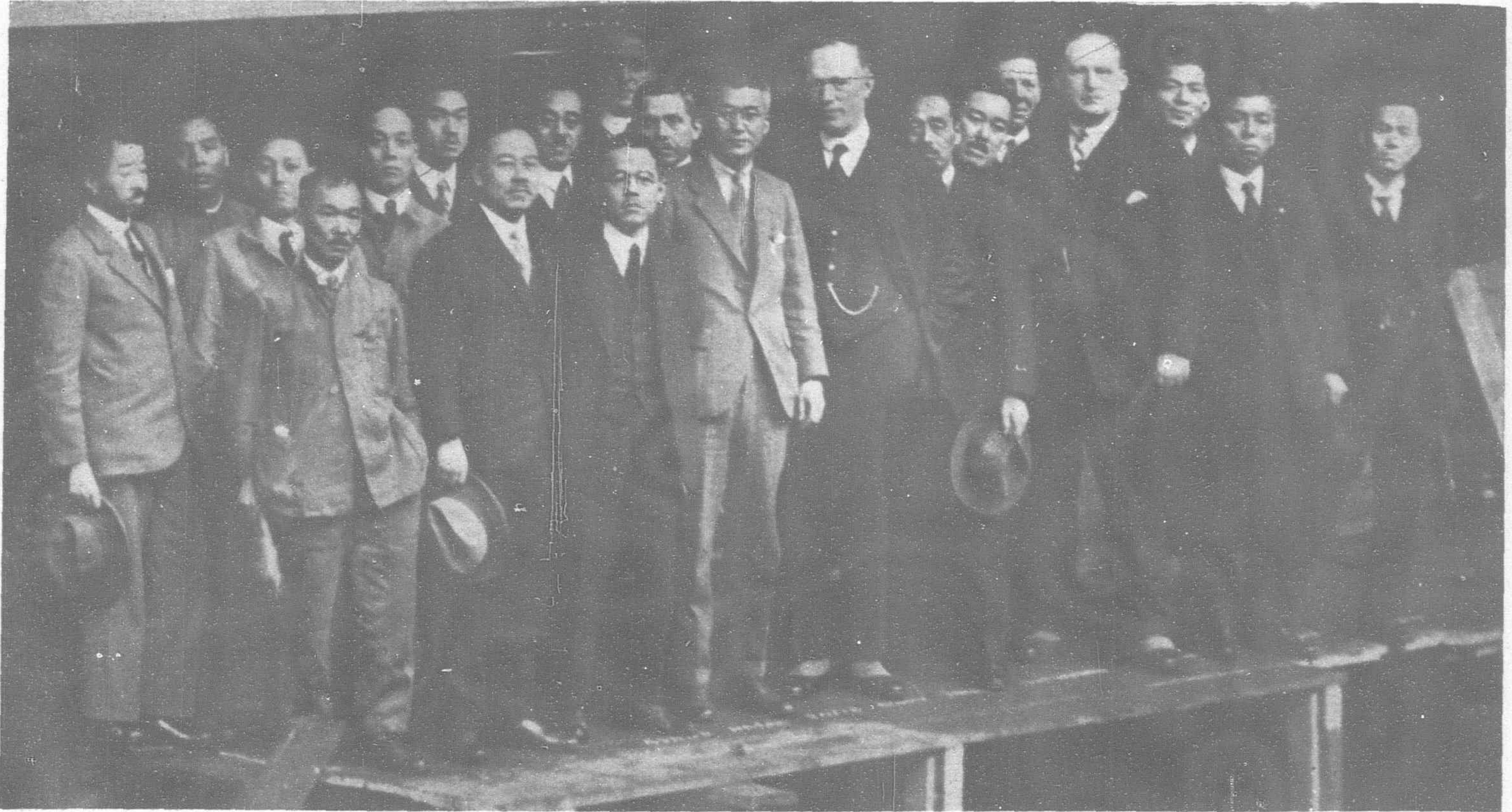
With the advent of the *Chichibu Maru*, however, it will probably be thought that the beauty and splendour of her Public Rooms are even greater than in the case of her sister ships, they have been decorated and furnished in the most elaborate and unique style of the modern art specially adopted for this ship.

Besides these beautiful Public Rooms, other special features are a Beauty Parlour for lady passengers and a branch office of the Sumitomo Bank, the provision of a bank being the first attempt of the kind ever made by any trans-Pacific steamship line. Though there is a dark room for the use of amateur photographers, the ship carries a professional photographer, who does photographing, developing and printing at fixed prices.

The salient characteristic of the new liner is, as in the case of her sister ships, extraordinary "roominess" in the passenger quarters, that is, decks, Public Rooms and staterooms. This is one of the chief essentials of modern sea travel and always demanded by experienced voyagers.

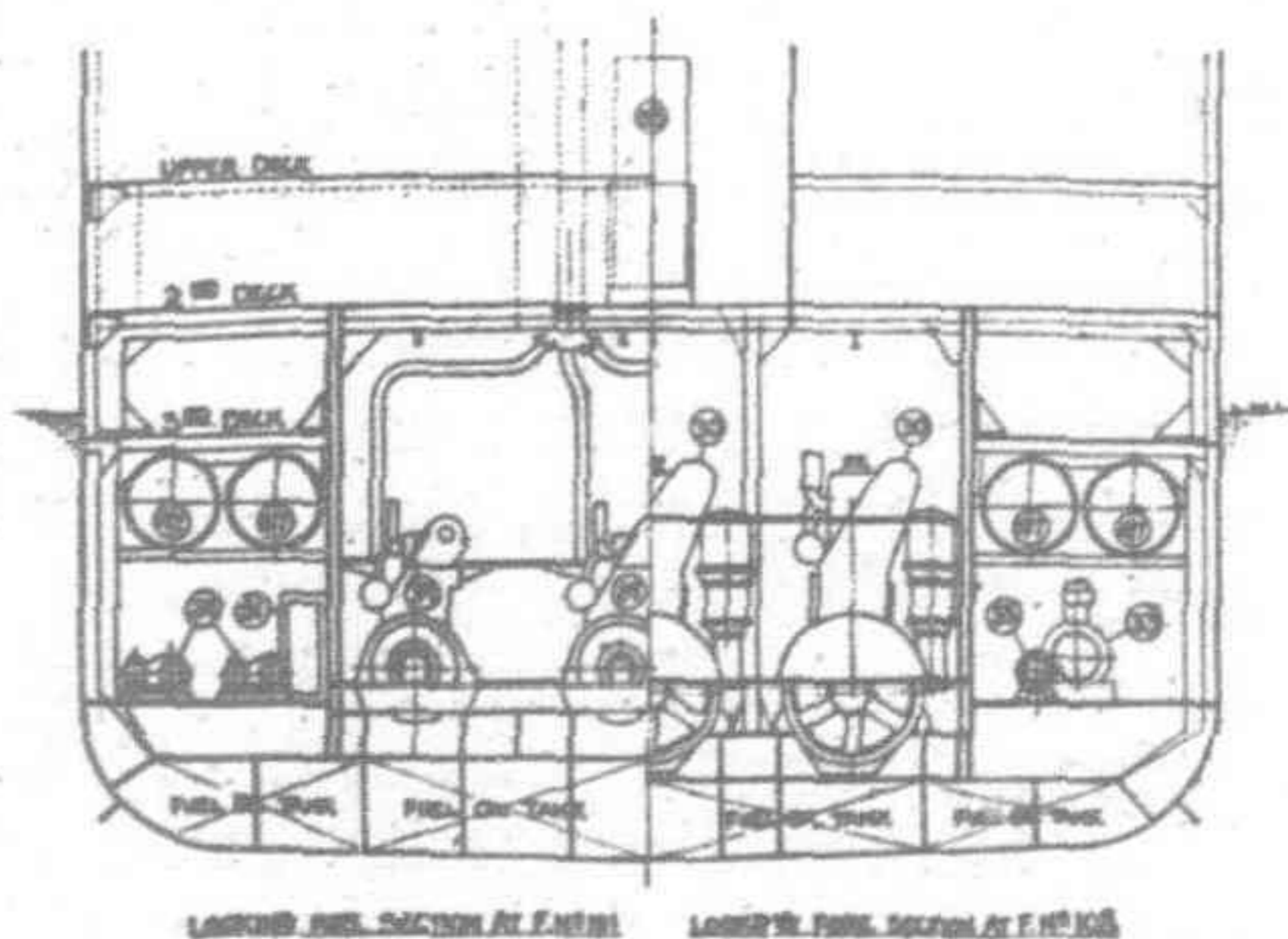
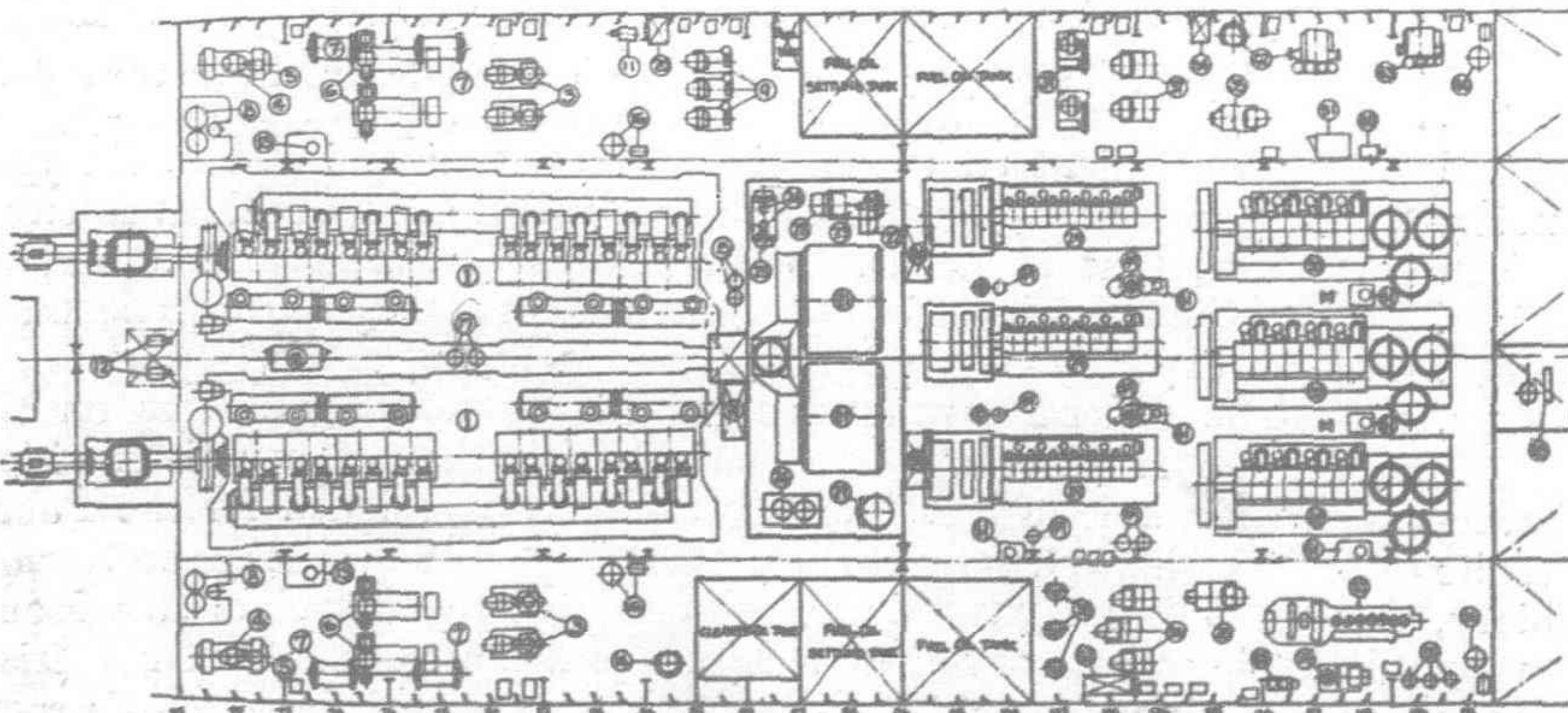
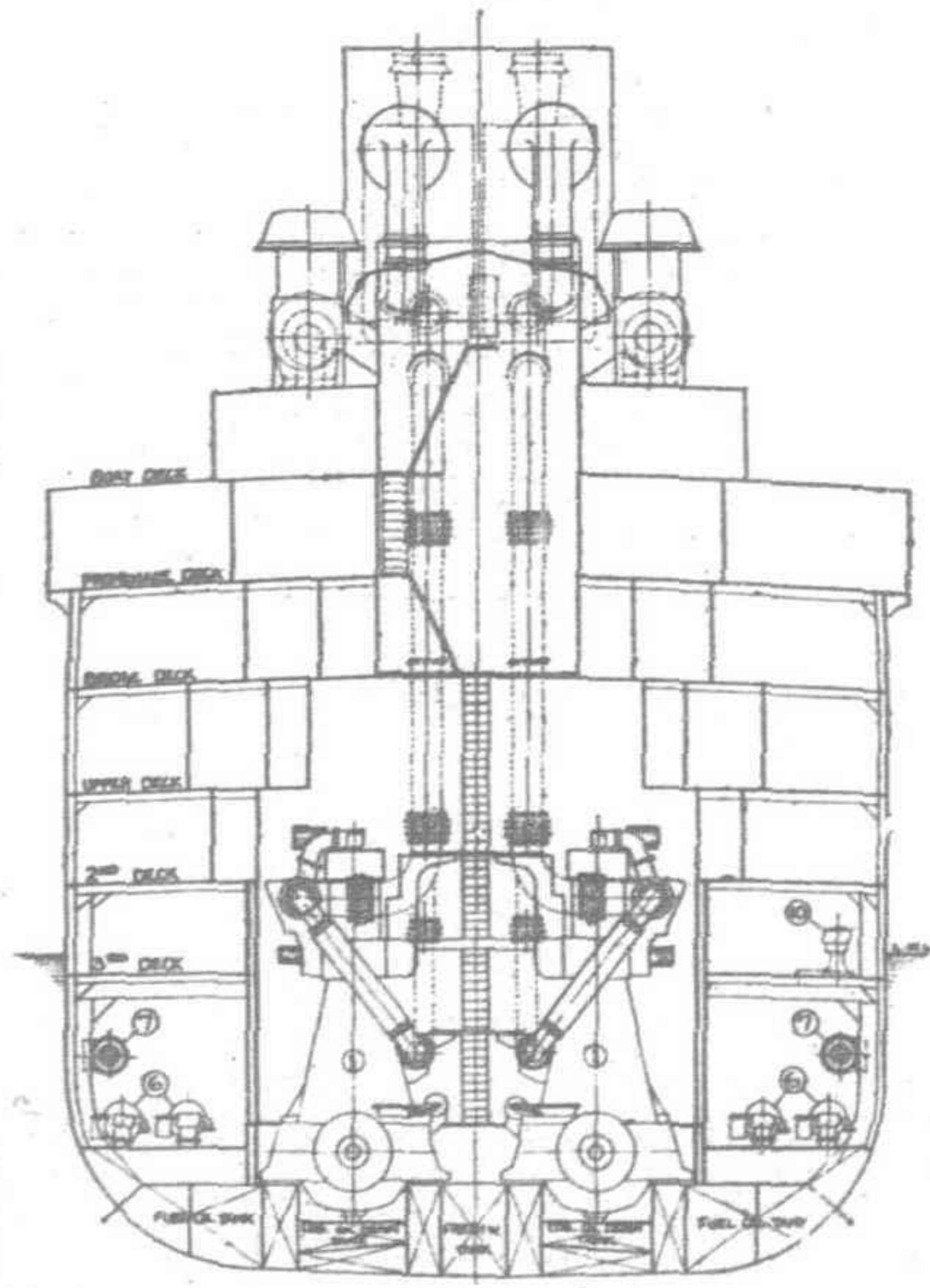
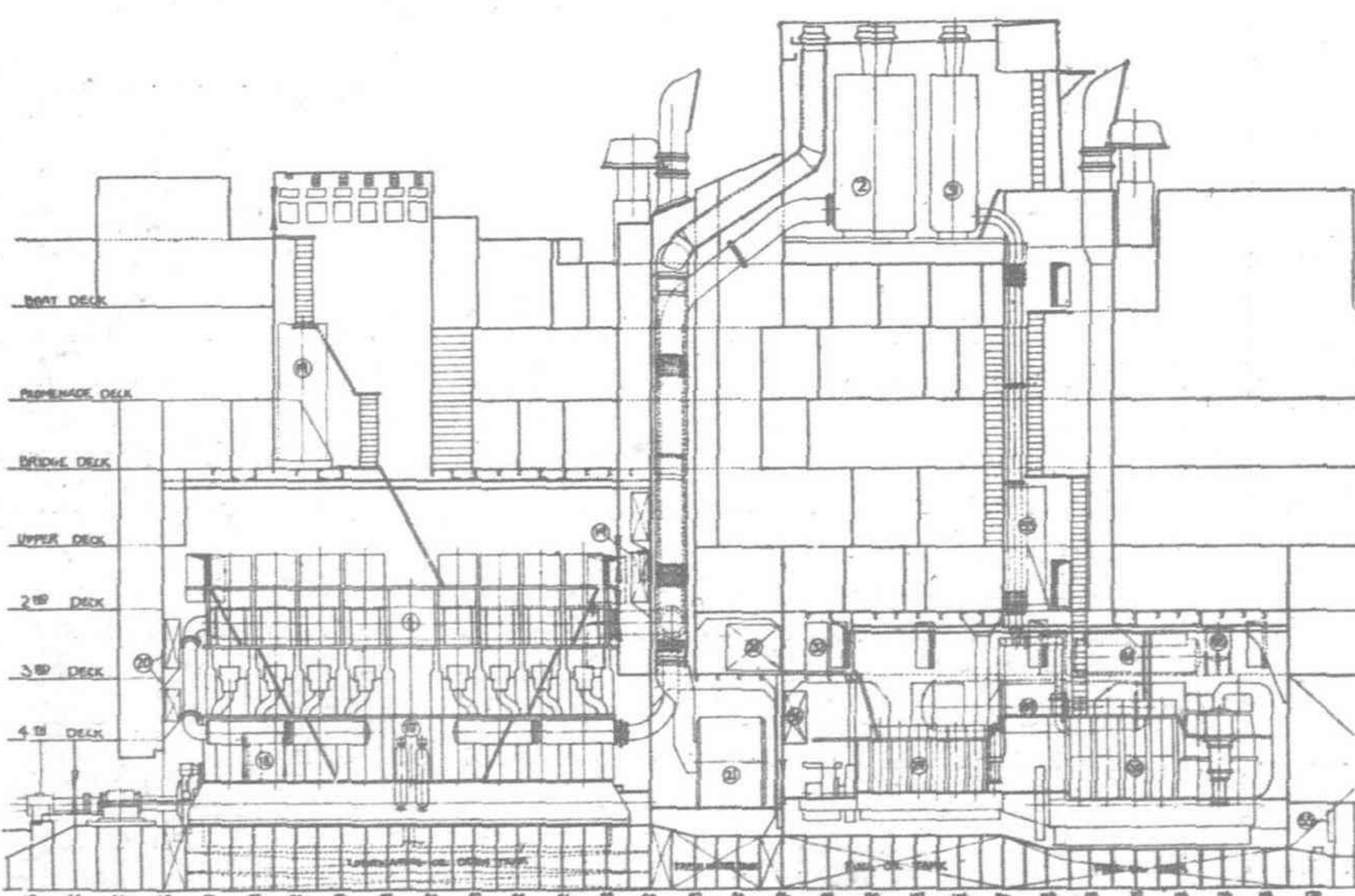
The general arrangement of the passenger quarters on the *Chichibu Maru* is almost identical with that of her sister ships, i.e., the whole of "A" deck is exclusively assigned for the Public Rooms, where passengers spend most of their time during the voyage, and "B" and "C" decks are occupied by first class staterooms including 2 sets of Suites de Luxe. Each set of the Suites consists of a Sitting-Room, a Bed-Room, a private bath, a servant's room and a trunk-room.

ENGINEERS TEST, "CHICHIBU MARU" MOTORS



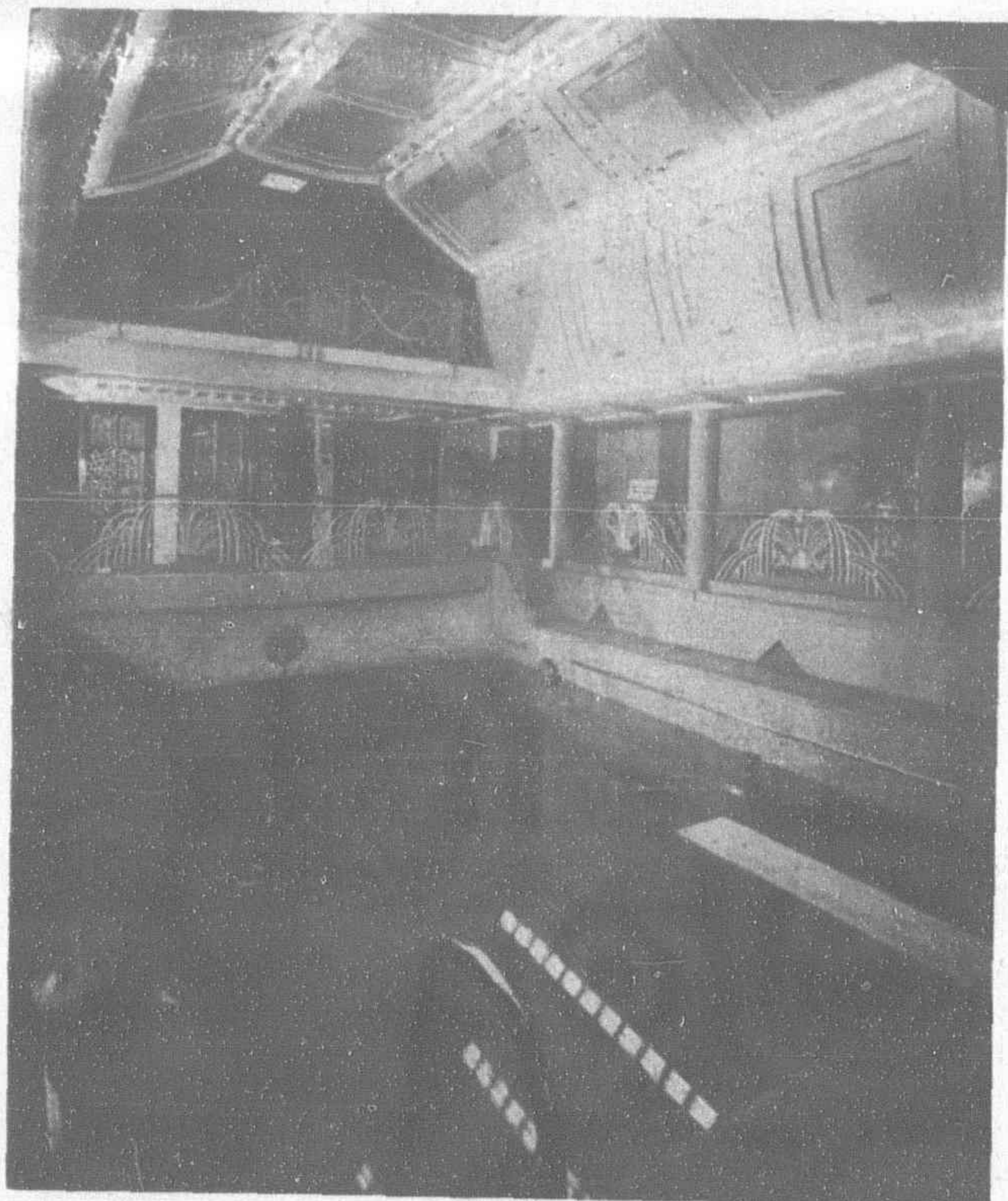
Previous to shipping the giant Diesel motors for the "Chichibu Maru" to Japan they were given exhaustive test runs on the test blocks of the manufacturers. This photograph includes the representatives of the shipbuilders, the Nippon Yusen Kaisha, the Mitsui Company and others interested in the ship. It was taken at the works of Burmeister and Wain, makers of the motors, at their Copenhagen erecting shop.

In the front row of picture second from the right is the chief engineer of the "Chichibu Maru," third Mr. Overgaard of Burmeister and Wain, fourth and engineer of the Yokohama Dock Company, fifth Mr. Tahara, director of the same company, sixth Mr. Blache, of Burmeister and Wain and next to him Mr. Hatanaka, representative of Mitsui and Company, agents for the Danish Company in Japan and next to him Mr. Asano, inspector for the steamship company and in back of him Mr. Kanamori, inspector for the Yokohama Dock Company.



NO.	DESCRIPTION
1	MAIN DIESEL ENGINES
2	EXHAUST SHUTTER (MAIN ENGINE)
3	SAFETY WATER CIRCULATING PUMPS
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100	SAFETY WATER CIRCULATING PUMPS

The general arrangement of the engine room of the "Chichibu Maru" shown above indicates the space saving accomplished through the use of Diesel power. The upper left hand drawing is an elevation of this department of the ship while below that is a plan of the same section. In the upper right hand drawing a cross section of the main engines and their relation to the hull is shown and in the lower right hand corner are two views of various sections of the auxiliary equipment.



Swimming Pool



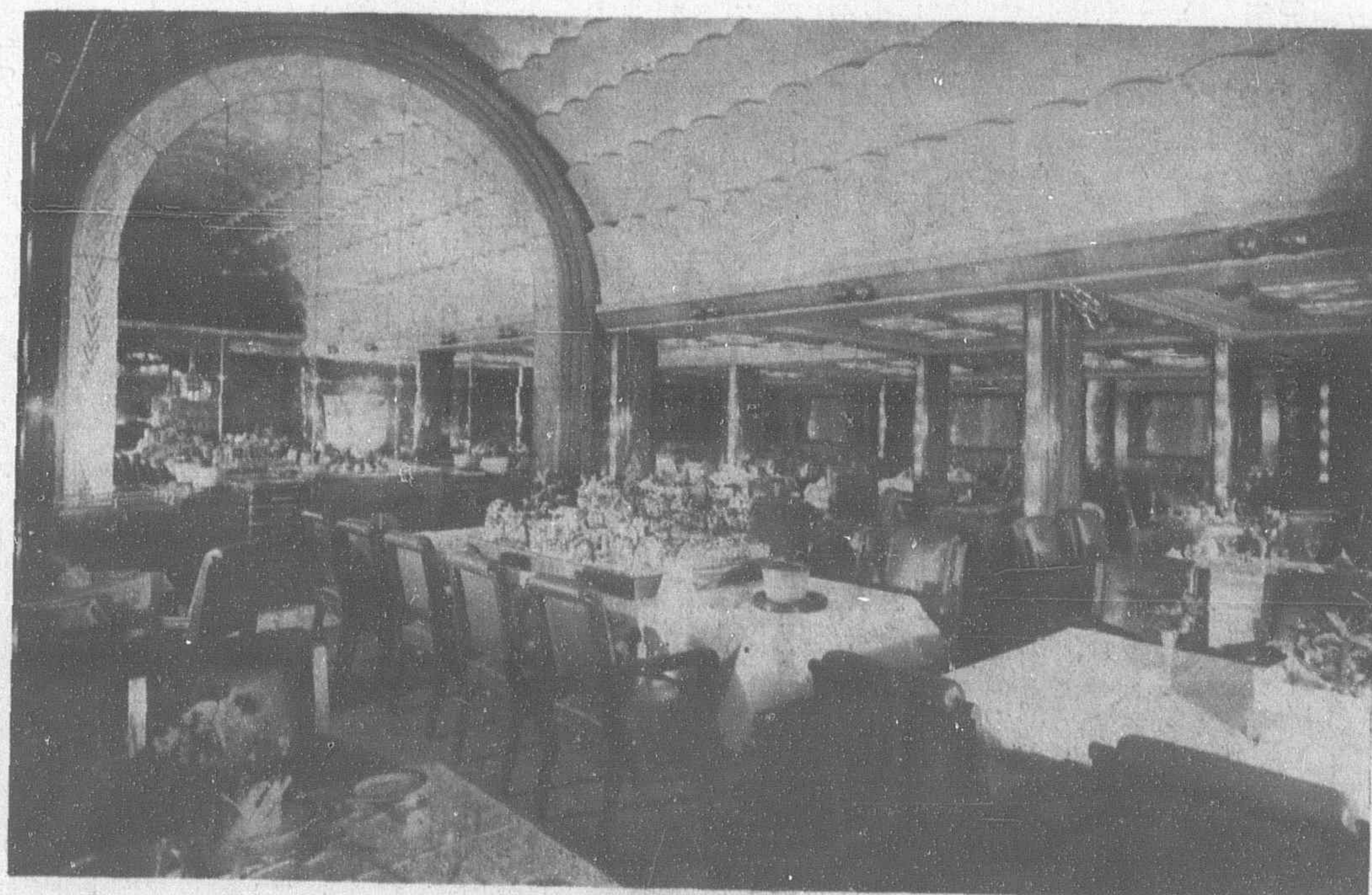
First Class Dining Saloon



First Class Lounge



First Class Lounge



First Class Dining Saloon

Most of the first class staterooms, numbering some 100, are outside rooms with windows opening directly on the sea. They are arranged to accommodate from one to four passengers, the latter accommodation being particularly convenient for a family with children. Of these staterooms, many have a bath attached, 24 are single-bedded, seven are two-bedded, 67 are three-bedded and two are four-bedded. They are all beautifully furnished, unusually roomy and fitted with beds instead of berths, some with pullmans as extras. The beds are wide and provided with the finest Simon's beautyrest spring mattresses with fleecy blankets and snowy linen. Hot and cold running water and telephone connection are installed in every room.

Special mention should be made here of the fact that the latest Thermotank Punkah Louvre system of ventilation is fitted throughout the passenger quarters, in staterooms and Public Rooms alike, through which fresh air is mechanically forced into each room and can be delivered in any direction as desired by passengers.

PUBLIC ROOMS.—Whereas all the decorative work and furnishing of the Public Rooms on both the *Asama Maru* and *Tatsuta Maru* have been handled by Messrs. Waring and Gillow of London, the corresponding work on the *Chichibu Maru* are jointly executed by Messrs. Heaton, Tabb & Co., Ltd., of London and Messrs. Marc Simon of Paris, each firm taking charge of different rooms and giving a full display of its respective individual merit in its trade. As exceptions, however, the Verandah is decorated by a Japanese firm, and all of the second class Public Rooms, except Smoking Room, are handled by the Yokohama Dock Co.

The Public Rooms handled by Messrs. Heaton, Tabb and Co., Ltd., are the first and second class Smoking-Rooms, first and second class Lounges, the Gallery and the first class Entrance and Foyer. On the other hand, those executed by the famous Paris firm are the first class Dining-Saloon, first class Private Dining-room, and Reading and Writing-Room and Swimming-Pool.

Of the decoration and furnishing of these Public Rooms, a word of emphasis is necessary with regard to the merit of the work executed by Messrs. Marc Simon, and also that of the Lounge done by Messrs. Heaton, Tabb & Co., Ltd., all of which strike a new note in design. The style of the decoration applied to these particular rooms is that of L'Art Moderne, which is regarded at present as an innovation in decoration and furnishing. Though there is a tendency for it to become a vogue in this field, so far only a few ambitious artists have ever attempted its application for a similar purpose.

We give below a brief description of some of the Public Rooms on the *Chichibu Maru*.

VERANDAH.—The Verandah for the first class passengers at the aft end of the Boat Deck, is enclosed on three sides, of which the port and starboard sides have large windows. The place was designed and executed by the Takashima-ya of Tokyo in the classic style of mediæval Japan, and, with its unique structure and decoration, it will be, together with the Japanese Rooms, one of the most interesting Public Rooms on the ship, particularly for foreign passengers.

The entrance of the Verandah, from the inside to the porch outside, is in the form of an elegant wooden gate, modelled after that well-known gate in Kyoto, said to have been designed by Kobori Enshu, that master landscape gardener who lived in the 17th century. The transoms of the entire room are decorated with open ornamental work of arabesque exquisitely executed in wood painted in celadon-colour.

The center of the fore end of the room represents a ceremonial *tokonoma* of a room in a Samurai's house, with a coffered ceiling painted a dull white. In the alcove, there is a gorgeous Japanese helmet (*kabuto*) of olden times on a chest (for arms) on each side of which a sheaf of arrows and a sword are placed. On the wall behind the display, three shields are hung, the central one of which bears the sacred crest of the Chichibu Shrine, from which the name of the new liner is taken. On the wall, on each side of the alcove, there is a lacquered wooden helmet called *jingasa*, such as was generally used by the Samurai class in the days of feudal Japan. Provided with tables and chairs and adorned with potted plants and flowers, this place will be the most restful aboard for passengers.

The outside of the Verandah is a porch spacious enough to be a most desirable place for observation. By the stairs leading from the porch to the open promenade deck below, there is a pair

of stone lions modelled after those dedicated to the Chichibu Shrine. At the foot of the stairs, there is a fountain of fresh water constantly playing.

JAPANESE ROOMS.—On the starboard side, adjoining the Verandah, there is a set of Japanese rooms, such as are usually found in a Japanese house of the upper class. The general plan of the rooms was designed by Messrs. Sasaki Co. of Yokohama and executed by Messrs. Takenaka Engineering Firm of Tokyo. The arrangement of these Japanese rooms is some-what different from that of those on the other two sister ships and they are also slightly larger. The set consists of an entrance room (3 mats), a small passage hall, an anteroom (6 mats) and a *zashiki* (10 mats), the last of which is provided with a ceremonial *tokonoma* (alcove) and *fukurotodana* (a sort of cupboard). The whole of the wood-work in these rooms, with a few exceptions, is of the Japanese cypress. The floors of the rooms are covered with thick Japanese *tatami* mats. The fitting-up of these rooms on this trio of motor-ships is the first time a steamship company has ever attempted to place on an ocean-going vessel a regular Japanese room, and the set will be an unexpected delight, not only to Japanese passengers, but will give foreign passengers an opportunity to inspect the interior of a Japanese dwelling, thereby offering them a unique chance to get an interesting and attractive foretaste of Japan before reaching the country itself.

READING AND WRITING-ROOM.—As the decorators of this room declared themselves, the scheme of its decoration is "extremely simple but very luxurious." It is decorated in the Modern French style, as in the case of the other public rooms handled by Messrs. Marc Simon. The walls are covered with mottled Cuba mahogany wainscoting, and the furniture is of Macassan ebony veneer upholstered either in hide or in damask. At the upper parts of the pilasters electric lights are concealed behind engraved glass. The painted ceiling includes a series of engraved plates behind which numerous lights are provided, also an elevated central portion with luminous engraved glass mouldings.

Above the mantelpiece, which is of polished cream-colored slithe, there is a framed painting of the Chichibu Shrine done in black and white on silken fabric. An electrically operated clock is also placed above the mantelpiece.

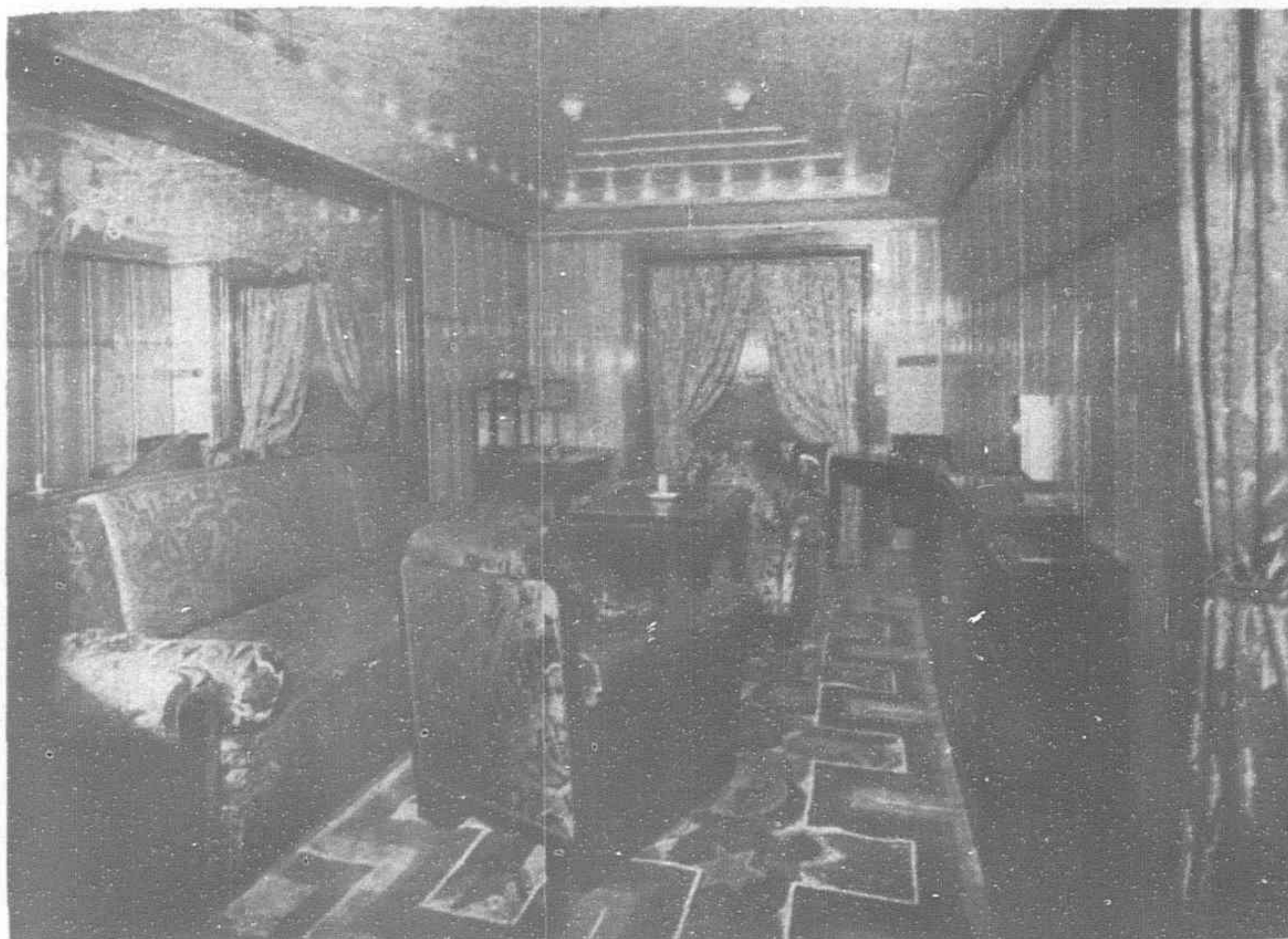
The whole of the color theme, from that of the wood-work to the carpet, produces a most restful atmosphere. The mahogany book-cases contain well-selected books by modern and classic authors, which, together with a variety of periodicals, will satisfy the wants of any discursive reader. The rich collection of the Oriental works placed in the library will be a special delight to those foreign passengers interested in things Oriental. This is also an ideal place for those who wish to write their pleasurable experiences on board the ship to their home or friends.

LOUNGE.—The Lounge, or Grand Saloon, situated amidships on "A" deck, is carefully decorated in the Modern English style with a lofty glazed dome over the central portion. The dome is constructed after the bizarre style of the Byzantine architecture. During the daytime, the light comes in through the double glass covering the dome, the inside of which is opal-colored, glazed glass fitted in a latticed frame-work. At night, when the hundreds of electric lights placed behind the glazed glass are all lit up, the exotic atmosphere produced by the magic of the lights, gives one the impression of being in one of the great halls in the palace of a Byzantine king. On both sides, port and starboard, of the well-opening to the dome, there are two sets each of lights, arranged in pagoda form, enclosed in gold-colored glass. The effect of the reflection created jointly by these lights and those in the dome baffles description.

The color scheme of the entire room is in turquoise blue, gold and ivory; the design is simple in character depending on harmonious coloring and fine architectural proportions for its effect.

The walls are covered with painted wood, and the furniture of mahogany, comprising comfortable settees and chairs of various kinds, is upholstered in the blue and gold silk velvet. Mahogany tables, square and circular, are covered with dainty damask tablecloths, lined and edged with cut fringe. The floor is inlaid with oak parquetry and is covered with large Coronal Wilton rugs of handsome Persian design.

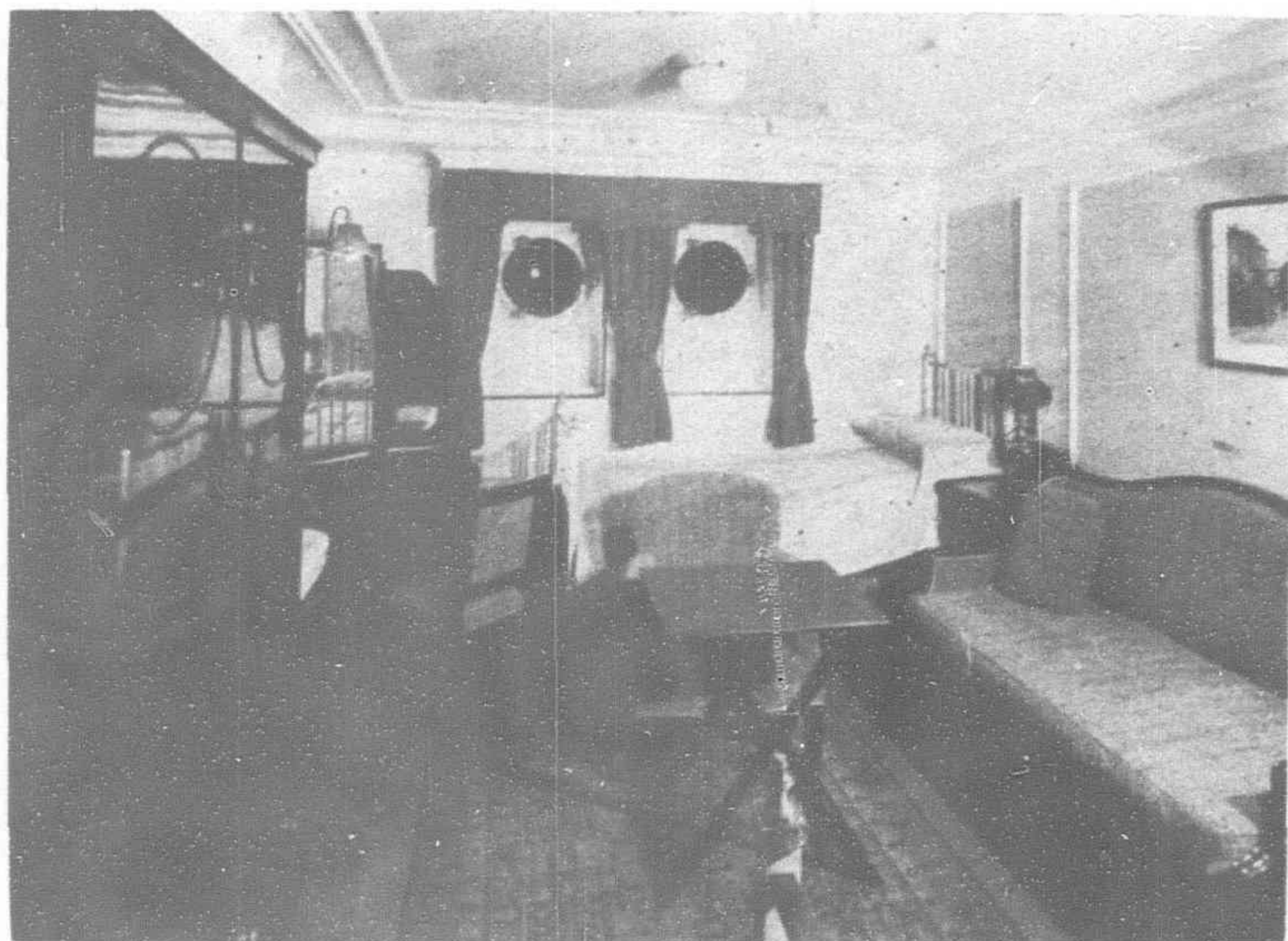
By removing the rugs, the place can instantly be converted into a perfectly-floored, grand ball-room, wherein passengers may dance to the accompaniment of the ship's choice orchestra.



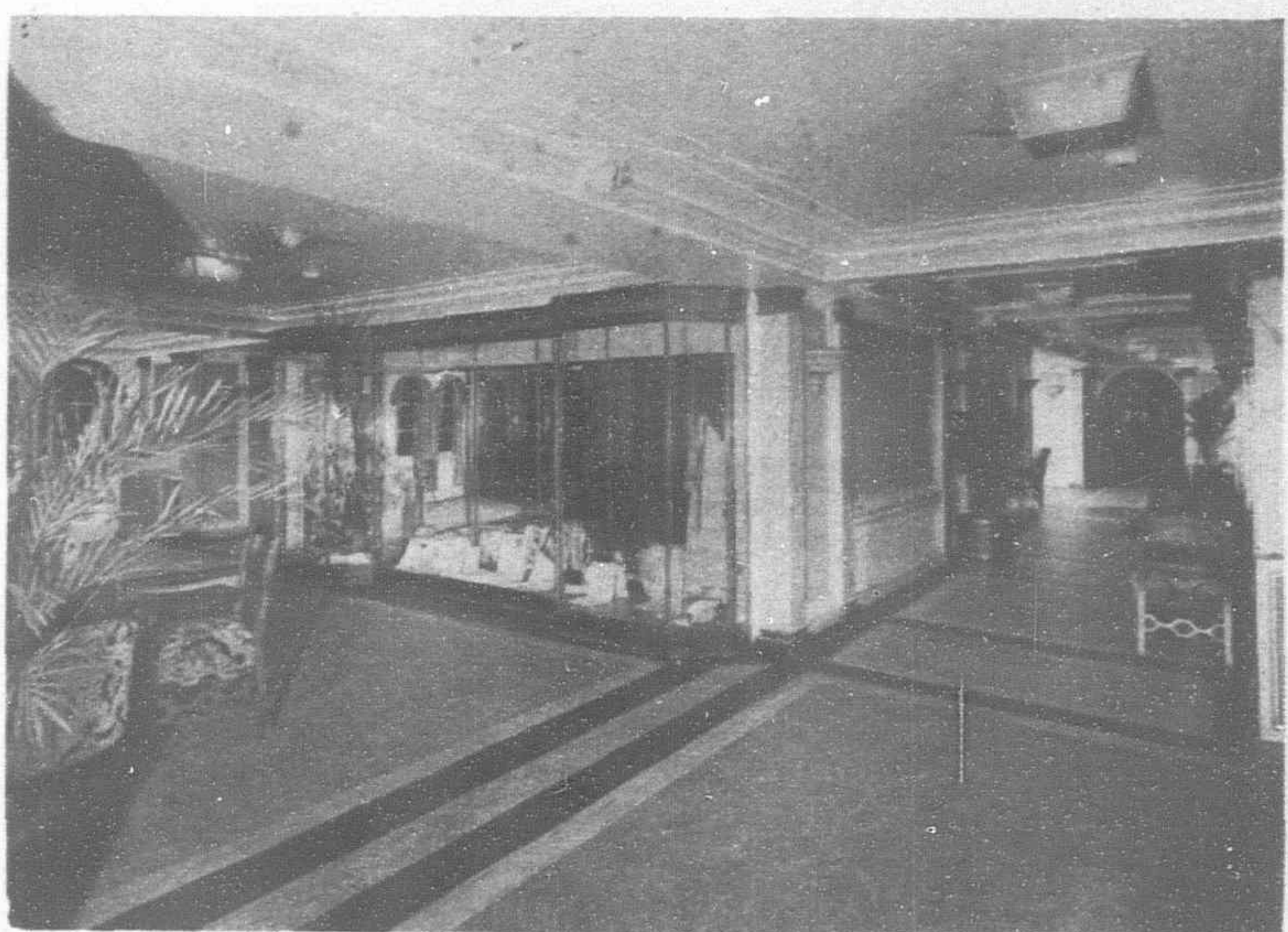
Sitting Room: Suite de Luxe



First Class Stateroom



First Class Stateroom: Two Beds



Gallery and Shops



First Class Smoking Room



Verandah Cafe

A regular stage with a semi-circular proscenium arch is at the fore end of the room, with a permanent proscenium curtain of golden silk. A grand piano, footlights, and other necessary paraphernalia for theatrical performances or concerts are completely

provided. For the presentation of cinematograph films and talkies, high above on the aft end wall a cinema-projecting room is fixed.

In front of the hearth at the aft end of this room, will be spread a huge bear skin rug, and above the mantelpiece, an electric clock

is fixed on the wall. The refreshing green of palms in pots and cut flowers of the season in vases abundantly placed in the room help to produce the illusion of being on land.

GALLERY.—The passage-ways from the Lounge to the Smoking-Room, both on port and starboard sides, constitute Galleries. The place is decorated in the style of the glorious Florentine period of Leonardo da Vinci. Several twin, arched windows at both

mirror on the back wall, in which some of the representative products of Japan, from dainty silk kimono to *cloisonne* wares are exhibited, this giving passengers some idea of what to purchase after arriving in Japan.

SMOKING-ROOM.—The Smoking-Room is at the aft end of "A" deck and may be entered from the Gallery. It is decorated after the elegant style of the William and Mary period, and the

SECOND CLASS ACCOMMODATIONS "CHICHIBU MARU"



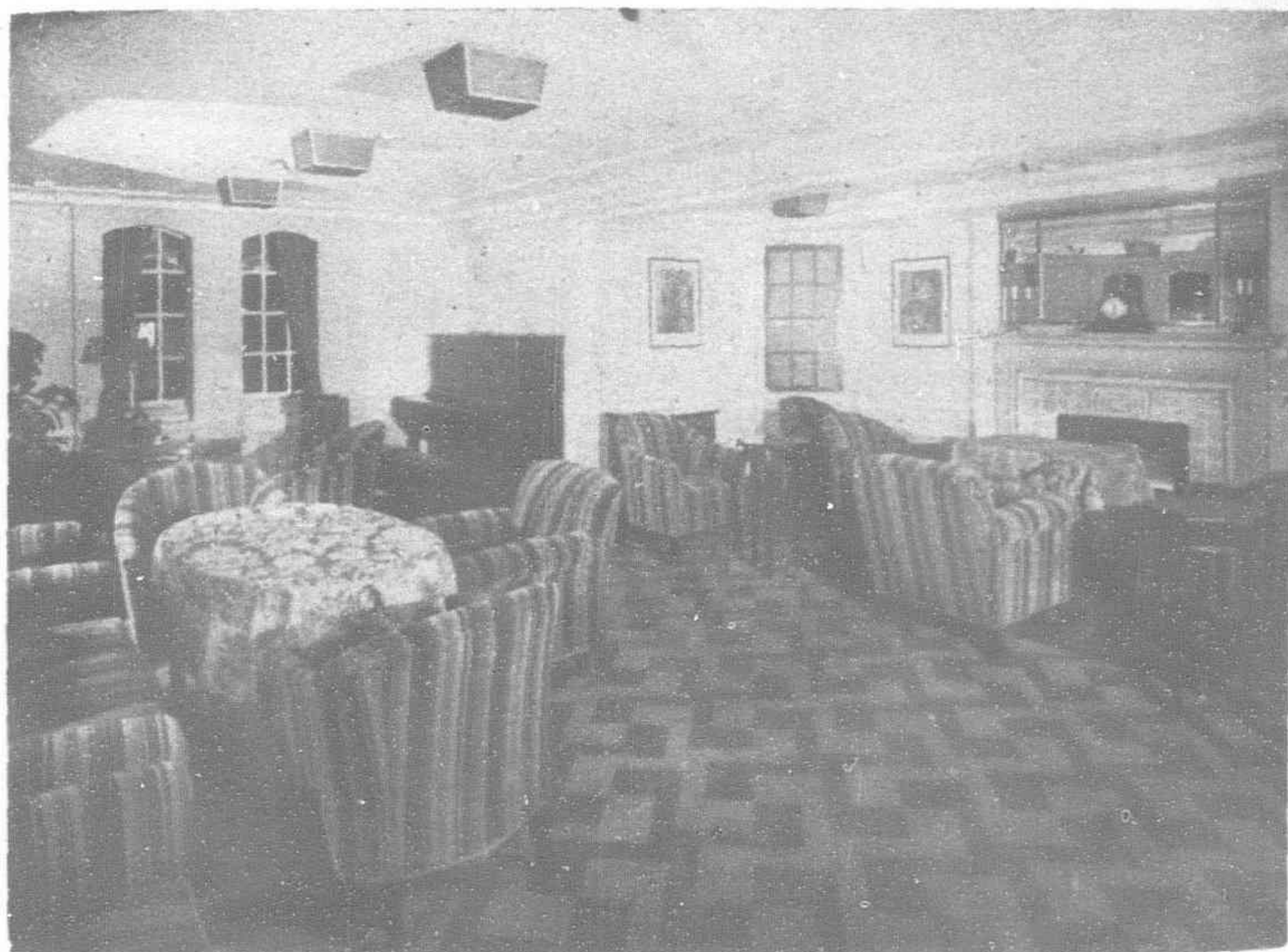
Smoking Room



Second Class Stateroom: Two Beds



Dining Saloon



Lounge

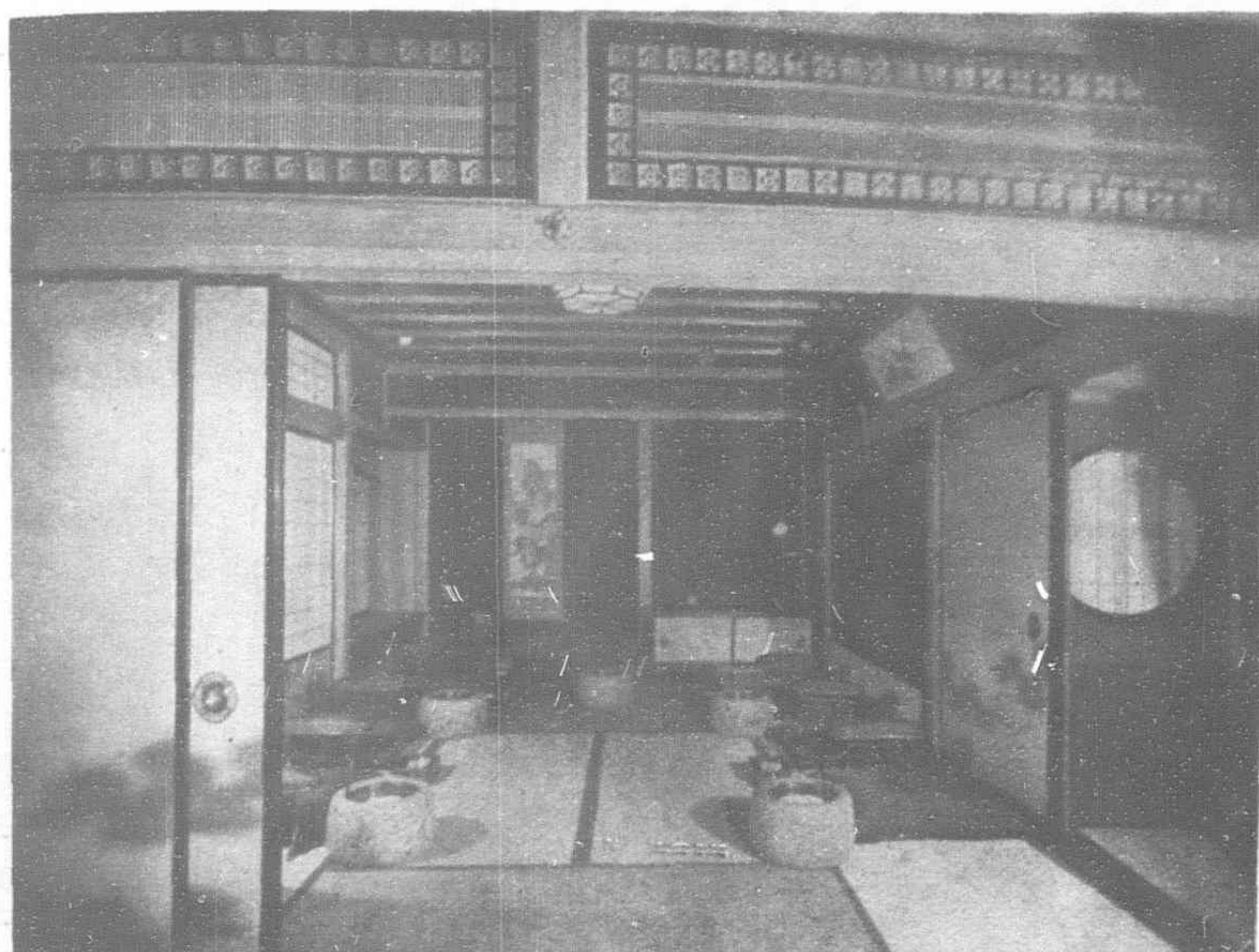
sides of the Gallery are exquisitely decorated with three round-pilasters painted in orange color, the capital of the central one being ornamented after that of the pillars in the Palazzo Pandolfini at Florence. With walnut furniture upholstered in gold velvet and walls of painted sundeala with a number of fantastically-shaped electric lamps and other decorative works, the artistic effect of this room will convey the typical mood of an art attributed to that period. The windows are hung with curtains of damask in old blue and silver, and the floor is covered with a marble pattern ruboleum. Walnut double writing-tables placed here will afford convenience to those who wish to write their letters in a place other than in the Writing-Room.

A feature of the Gallery is, as in case of her sister ships, the provision made for the hanging of a collection of pictures on the walls, the intention being to have these changed from time to time.

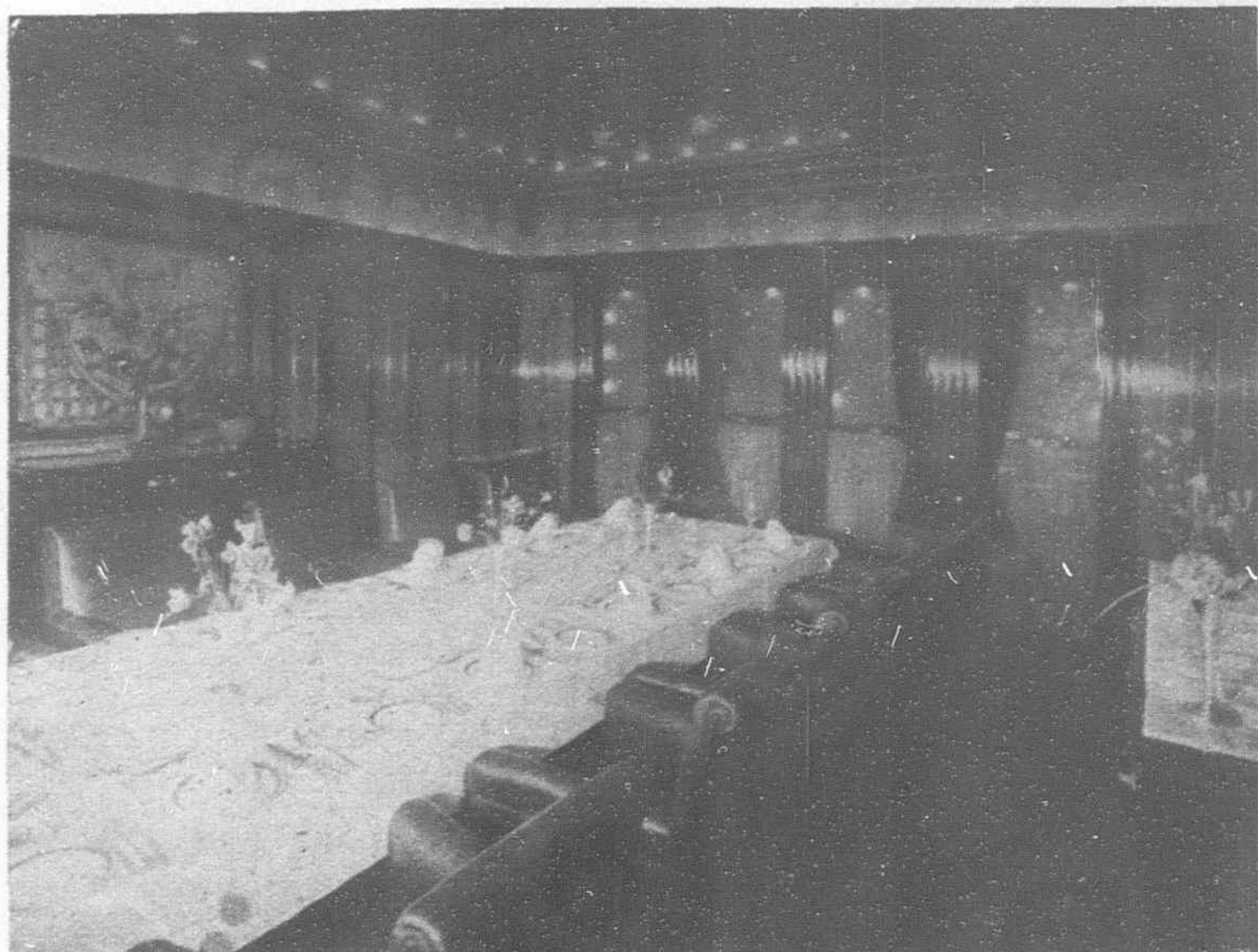
In a short connecting passage between the galleries on both sides, there is a regular-sized show window, with a large

general plan and design of the room are on a level with the famous architectural art produced by Sir Christopher Wren. It has large windows on both sides, and the walls are of English walnut, natural color, oiled and wax polished. The comfortable settees and armchairs of English walnut are either upholstered in brilliant colored tapestry or in blue hide. In the recess at the forward end, there is a Pavonazzo marble hearth, above which is an oil painting depicting flowers and grapes in a most graceful manner, under which there is a mirror with an electrically operated clock in the center. On each side of the picture hanging below the cornice are highly ornate panels of ash carved after the style of Grinling Gibbons.

The raised ceiling in the center is supported by painted columns of marble finish, and is covered with a central panel on which clouds are painted in a decorative style. The room is lighted mainly by an indirect lighting system fixed in the cove of the ceiling. A number of light brackets are fitted on the walls, the lamps of these being very artistic in shape. Several lights hanging from



Japanese Room



Private Dining Room



First Class Smoking Room



First Class Promenade Deck Glass Enclosed

the ceiling are enveloped in yellowish glass. Aft midship there is an alcove, right opposite the fire-place, the corners of which form niches with an ornamental lamp-stand of brass in each. On the wall between the niches is a figured silk brocade the subject of which is a typical Japanese landscape with Mt. Fuji in the background.

Here one can enjoy a smoke or a chat in front of the cosy fireplace, or one may indulge in various games, from popular Mah Jong to classical bridge.

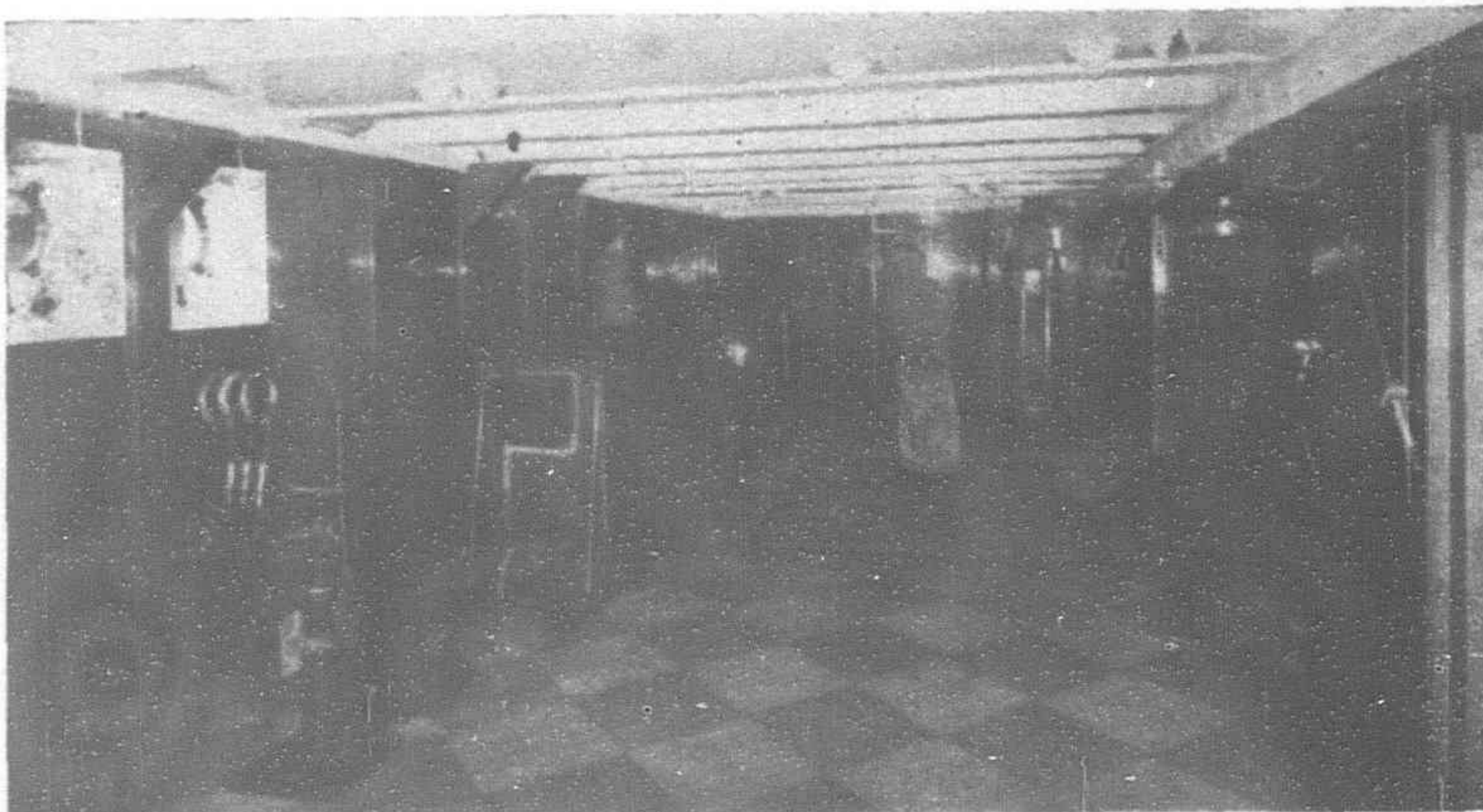
ENTRANCE.—A spacious Entrance Hall for the first class passengers is situated on "B" deck and is decorated in the style of the late Renaissance, as in the case of the Foyer on the deck above. The place has many large windows, three in a group, of translucent glass with mahogany frames. The pillars are of the Doric style, their capitals being ornamented with arabesque designs in gold. The walls of the Hall, as well as those of the Foyer, are decorated with a number of beautiful bas reliefs the subject of which represents a procession of the ancient Greek populace celebrating the festival of Bacchus. The ceiling and the entrance of

the Hall are decorated after the manner of the entrance of the Temple of Eretheus of ancient Athens.

This place, with settees and tables and cushioned cane chairs, may conveniently be used as a large Drawing-Room. The window of the Enquiry Office opens to the Hall facing the passengers' elevator, which affords communication between the seven decks. All required information regarding itineraries, hotel reservation, etc. can be obtained here.

DINING-SALOON. In the decoration of this marvellous Dining-Room, the decorators, Messrs. Marc Simon, have proudly asserted, "the scheme we are submitting is conceived in an extremely luxurious decorative style." This wonderful Dining-Saloon for first class passengers is at the center of "C" deck, two decks high in the center, its walls being covered with moulded woodwork of ash and French walnut.

There are in the room a number of large, elongated square columns of French walnut, of which mention should be made for their unique construction and beauty. The elongated sides of the columns



Gymnasium

are embellished with hand-carved designs of flowers and leaves executed in a fine decorative manner, while their pointed sides are fitted, throughout the length of the column, with moulded engraved glass plates, inside of which are placed numerous electric lights.

On the walls on each side of the fore and aft ends of the room, there are beautiful marquetry works showing four different views of the garden of the Versailles Palace, one of which represents the world-famous fountain. The aft end surface of the central projecting part of the room is a large mirror of silvered glass reaching to the top of the arching. The upper part of the arching, formed between the last two redans, is decorated with a painting representing a heavenly vista with clouds through which run milky-ways with stars of various shape. Both sides of the arching are constructed as a cornice, where many rows of electric lights are concealed. When all of the lights are lit up, the effect of the reflection in the dome is singularly remarkable. The upper part of the sideboard in the center of the projecting part of the fore wall is of an engraved ground-glass, which has an electric clock in its center.

The numerous square inside windows on both sides of the room are fitted with ornamented frosted glass, and around the frames between these inside windows and the outer ones more than a dozen electric globes are provided for the purpose of lighting. The pilasters in this room are also worth mentioning for the interesting decorative work applied to them. These pilasters of walnut are moulded horizontally in a most artistic manner with bands of quarter circle of silver style copper. Some of them have shelves at the lower part which may conveniently be used as sideboards. All doors at the entrances of the room are fitted with fire-proof glass.

Here passengers will be introduced to the famous N. Y. K. cuisine prepared by the N.Y.K. chefs, all culinary artists, trained in the leading hotels of New York, Paris and London. The food, excellent in both quality and mode of preparation, and faultlessly served by the willing and courteous stewards, will satisfy even the most fastidious epicurean. The ship's excellent orchestra, installed in the balcony at the fore end of this room, will delight one during the meal time.

PRIVATE DINING-ROOM.—Adjoining the great Dining-Saloon, there is a Private Dining-Room capable of accommodating eleven or more guests. It is a quaint room tastefully decorated somewhat in the same manner as the Dining-Saloon and Suites de Luxe on this liner. The wall coverings are panels of pale gray sycamore ply-wood and veneer, French polished, with marquetry of flower and leaf motif in framings of gilt copper.

On the wall over the side-board placed at the fore end of the room, there hangs a Gobelin tapestry of flowered design. At the center of the aft end, there is an ornamental mantelpiece of marble, above which a large mirror is fitted on the wall. The windows are exactly the same as those in the main Dining-Saloon and have a similar lighting system. The ceiling of painted ply-wood has lamps of delicate colored glass, and in the cornice of mahogany there is device for indirect lighting.

SUITES DE LUXE.—In marked contrast to the decoration applied to the Suites de Luxe on both the *Asama Maru* and the *Tatsuta Maru*, which are done either in the typical Japanese manner or in

Oriental style, those of the *Chichibu Maru* are decorated by Messrs. Mare Simon in the Modern French style, the most up-to-date mode in decorative art. In decoration and furnishing, the two Suites on this liner differ slightly from each other.

SUITE ON STARBOARD.—The walls of the Bed-Room of the Suite on the starboard side are covered with panels of satin-wood and amboine, carefully polished. The furniture in this room, i.e., settee, arm chairs, dressing-table with a glass top and swing mirror, small bookcase, etc., are also of amboine. The settee and chairs are richly upholstered in tapestry with modernistic designs.

The color scheme of the Sitting-Room is quite different from that of the Bed-Room. The panelling of the walls is of sycamore and Ceylon satin-wood with inlays of mother-of-pearl and marquetry. The furniture, including arm chairs, table-desk, playing-table, dressing-table, writing-table, small book-case, etc., is of rose-wood. Over the divan in this room, a large mirror is fitted on the wall, and, above it, an oil painting, the subject of which suits the mood of this room. The color of the carpet

and that of the upholstery of the chairs and the divan are perfectly in accord with the general color of the whole room.

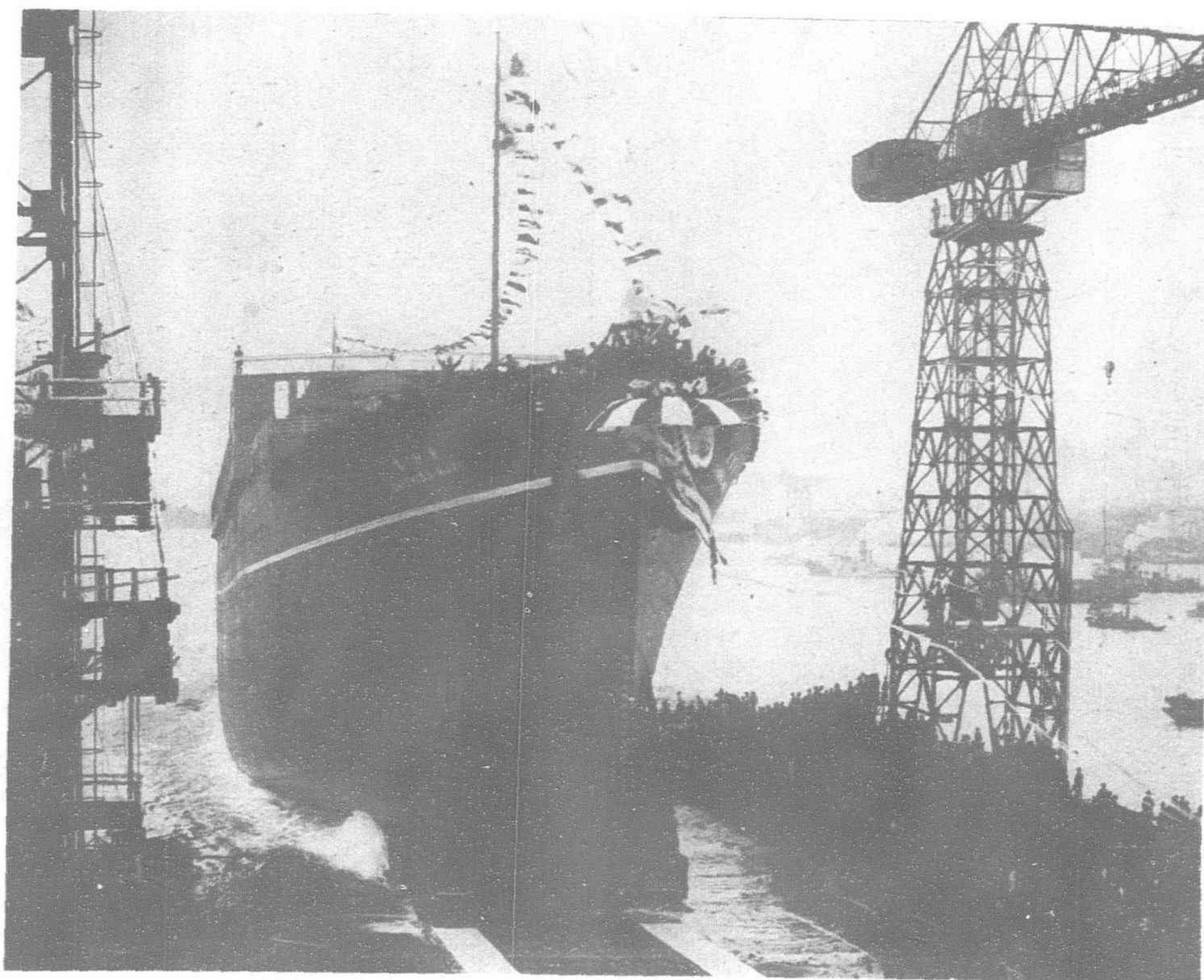
SUITE ON PORT-SIDE.—This Suite is decorated in the Modern French style, as in the case of the other on the starboard. The walls of the Bed-Room are of St. Domingo satin-wood and boll-ash, French polished, and have decorative marquetry of flower motif in frames of silver style copper fitted in at certain places. In the coffered ceiling, several lamps with engraved glass shades are installed. The settee has comfortable cushions of purple silk.

The wood-work of the Sitting-Room is of sycamore, ash and boll-ash, with stencilled frieze and upper part. The divan in this

room can be conveniently converted into a regular-sized bed if necessary, as in the other suite. Over the divan there is a decorative painting. In the cornice all around the room, tube lamps in Châlier style are installed for indirect lighting.

SWIMMING-POOL.—The Swimming-Pool, designed after that of the Roman period, and decorated in Modern French style, is on "E" deck and easily be reached from any upper decks by the passenger elevator. Like that of the *Asama Maru*, the basin of the pool on this liner measures 26 feet by 17 feet and 8 feet deep and is tiled with coloured mosaic-work. The entire central part of the fore end of the chamber is a large mirror. At the fore part of the dome is a decorative painting showing the famous fountain at Versailles Palace, the design of which is also applied to the hand-rails of hammered wrought iron fronting the galleries on three sides. The galleries are specifically reserved for onlookers. Around the pool, a number of Roman style benches of teak are placed for the bathers. The surface of the cylindrical columns, four on each side, is ornamented with exquisite colored mosaic, while the vertical surface of the entire room is covered with squares of pink Phocæan marble. The frieze running all round is composed of geometrical mosaic designs in beige and gold. In the dome, lines of electric lights run through from fore to aft, the total number of which is more than 300.

Continued on page 203



Launching of M.S. "Chichibu Maru" at the Yokohama Dockyard, May 8, 1929

The Latest Developments of the B. & W. Diesel Engine

H. H. Blache, Dr Tech.

THE Diesel engine as being constructed to-day is the result of more than thirty years theoretical and practical engineering experience, but a uniform type has not yet been developed.

The construction of Diesel engines requires very careful workmanship, a vast knowledge of the various metals to be used, and in particular a thorough acquaintance of foundry technics. The design and manufacture of Diesel engines requires also a very close co-operation of the drawing office and the workshop staffs. The development of the shop practice calls for amendments in the design and contributes to the fact that Diesel engine construction has been concentrated in comparatively few large concerns, where the experimenting and research work can be done and the manufacture then takes place in their own and their licensees' works, specialized for the manufacture on a large scale.

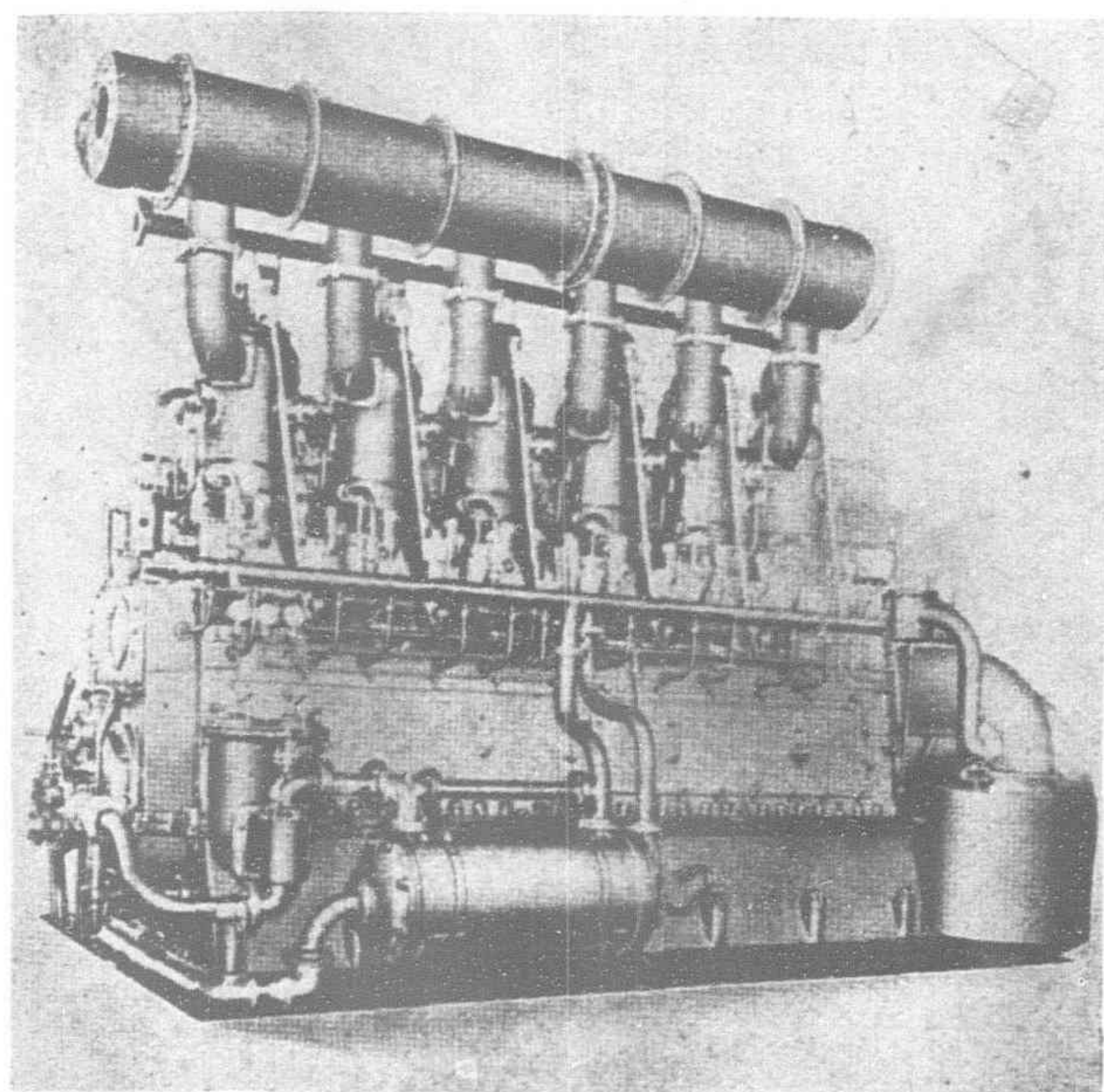
or when the ship gets into dirty river water, the gain in economy is very doubtful if at all.

The advantage of this modern improvement of the reciprocating steam plant is only of importance in comparison with the usual type of steam engine plant and is of no importance to the question of Steam versus Diesel.

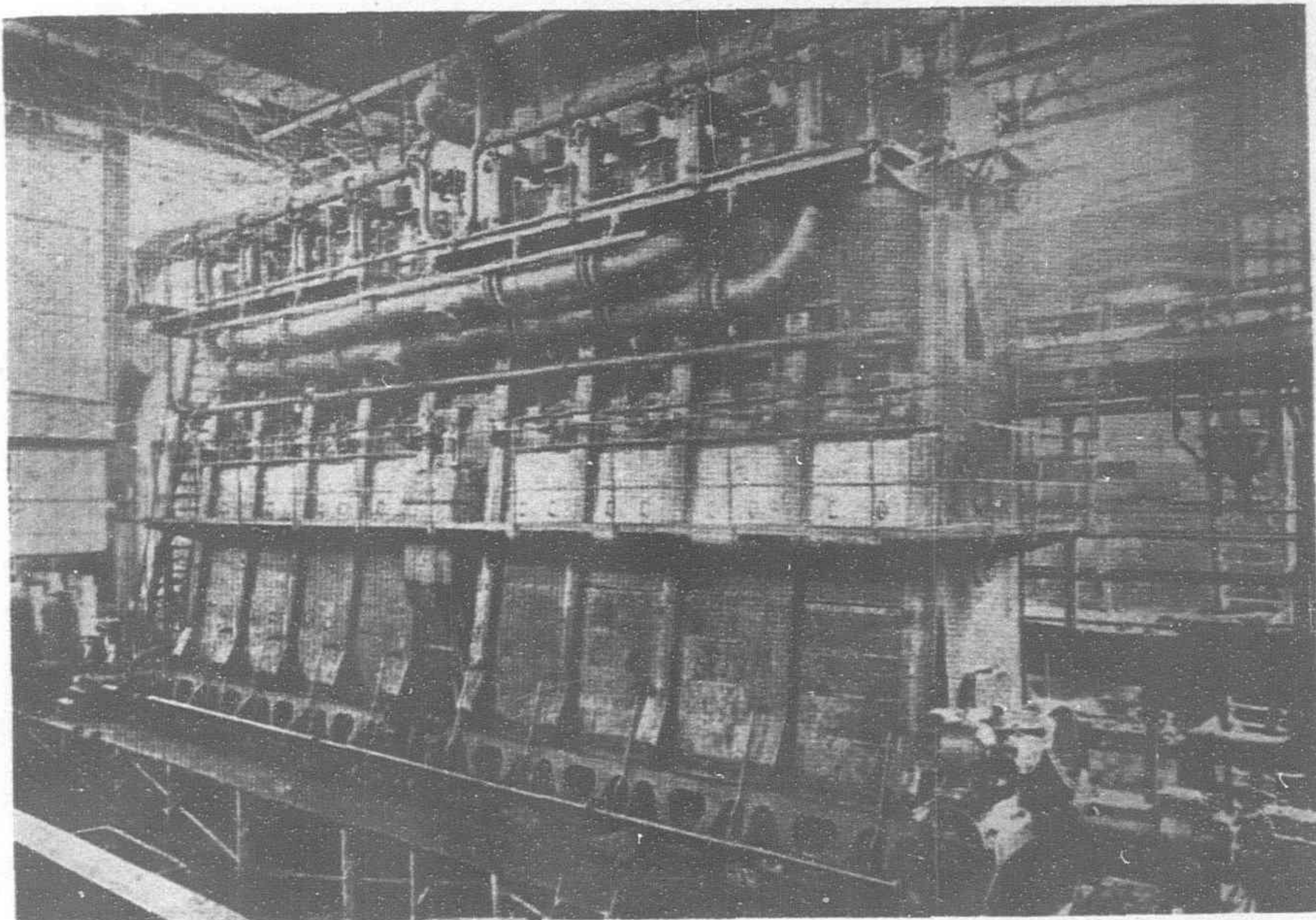
Exact data of actual results in service of similar types of steamships and motorships were given in the valuable paper of Director Kawamura read at the World Power Conference in Tokyo, to which I may refer.

The Main Types of the Marine Diesel Engines

The technical staff of owners and shipbuilders have still to choose between the various main types of Diesel engines, viz:



One of the 600 B.H.P. Single-acting B. & W. Two-stroke Diesel Engines Now Installed in M.S. "Amerika" as Dynamo-engines



One of the 5,000 B.H.P. B. & W. Diesel Engines for M.S. "Agamemnon" on Test Bed at B. & W.'s Works, Copenhagen

The Reason Why the Diesel Engine is being Utilized for Marine Purposes

The small consumption of fuel both with respect to price and weight, allowing long voyages without delay in calling at bunker depôts, and the fact that oil can be carried in the ship's double bottom, manipulated by means of piping only, and that useful cargo space is not being disposed of for the fuel, and that hard working firemen and trimmers are eliminated, are in particular the properties which, as they increase the money earning capacity of the motorships compared with the steamer, have contributed to the steadily increasing utilization of the Diesel engines for marine purposes.

By powdered coal firing for steamers which at present is much talked about, a similar mechanical treatment of the fuel may be obtained, but the coal bunkers and crushers will have to be located in such a way that much valuable cargo space is lost. Special, meagre coal has to be used which is not obtainable all over the world, and which limits the use of this type of steamship to special routes.

The steam consumption of the reciprocating steam engine can be decreased by about 15 to 20 per cent. by the use of exhaust steam turbine connected to the L.P. cylinder, but this new improvement of the steam plant increases the first cost, the overhaul and the cost of upkeep. The gain in economy depends exclusively upon the low degree of vacuum in the condenser, and in the tropics four-stroke or two-stroke cycle, single-acting or double-acting, blast air injection or airless injection, but national or financial

interests, the price, the space available, the working reliability and the costs of maintenance are the factors which determine their choice. The main question—four-stroke or two-stroke cycle has more or less been thrust into the background and the question is now; for which kind of ship is the one or the other type the better.

Burmeister & Wain have for many years solely built the four-stroke type, but their research work has resulted in the production of a special cast iron of high heat resistance quality, and in the invention of an entirely new and improved scavenging system, and a Burmeister & Wain double-acting two-cycle type engine is now put into service.

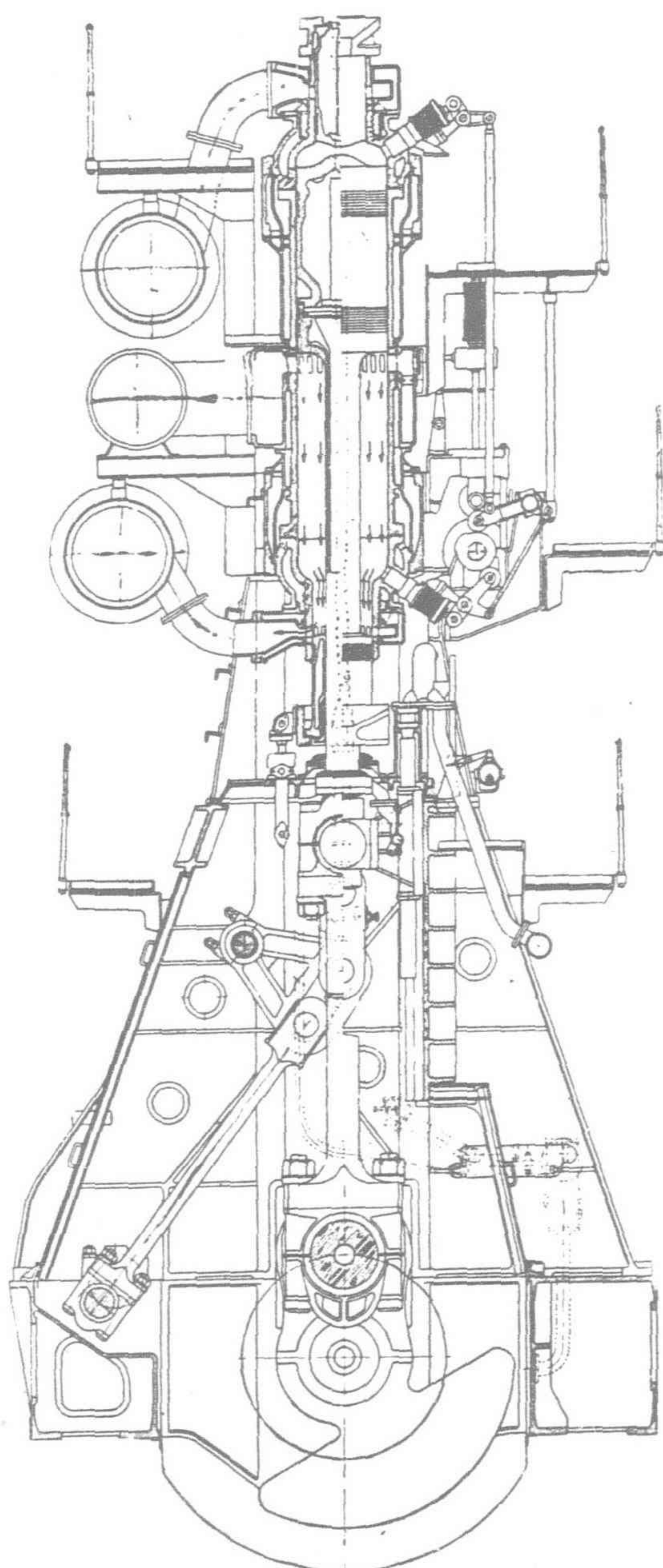
From competitors to B. & W., it is stated that the creation of a two-cycle B. & W. engine should prove that B. & W. has made a mistake up to now in building 4-cycle engines. That this is not the fact the following figures will prove.

According to Lloyd's Daily Index, dated July 30, 1929, there is a total of 812 motorships above 2,000 tons in service, viz:

Four-stroke	..	..	545 ships aggregating 3,316,955 gr. tons
Two-stroke	..	..	267 " " 1,870,129 " "

Totalling 812 ships aggregating 5,187,084 gr. tons
Of this total, 398 ships aggregating 2,437,014 gr. tons are equipped with B. & W. engines.

In the brief period of three years, from June 29, 1926 to July 30, 1929, B. & W. engines have been installed in 160 ships aggregating 1,089,864 tons. This makes Burmeister & Wain the leading manufacturers in the world of Diesel engines for marine purposes.



Section Through B. & W.'s Double-Acting Two-stroke Diesel Engine

At the present time there are on order 155 ships aggregating 959,675 tons which are to be equipped with B. & W. engines.

B. & W. Double-acting Two-stroke Cycle Engine

The B. & W. double-acting two-stroke cycle engine is in its design quite different from all other types of two-cycle engines built by other makers.

There are no complications of double scavenging ports and double exhaust ports in the center of the cylinder, for there is only one single row of scavenging ports and the exhaust is controlled by piston valves at each end, so that the engine in a certain way is like the steam engine.

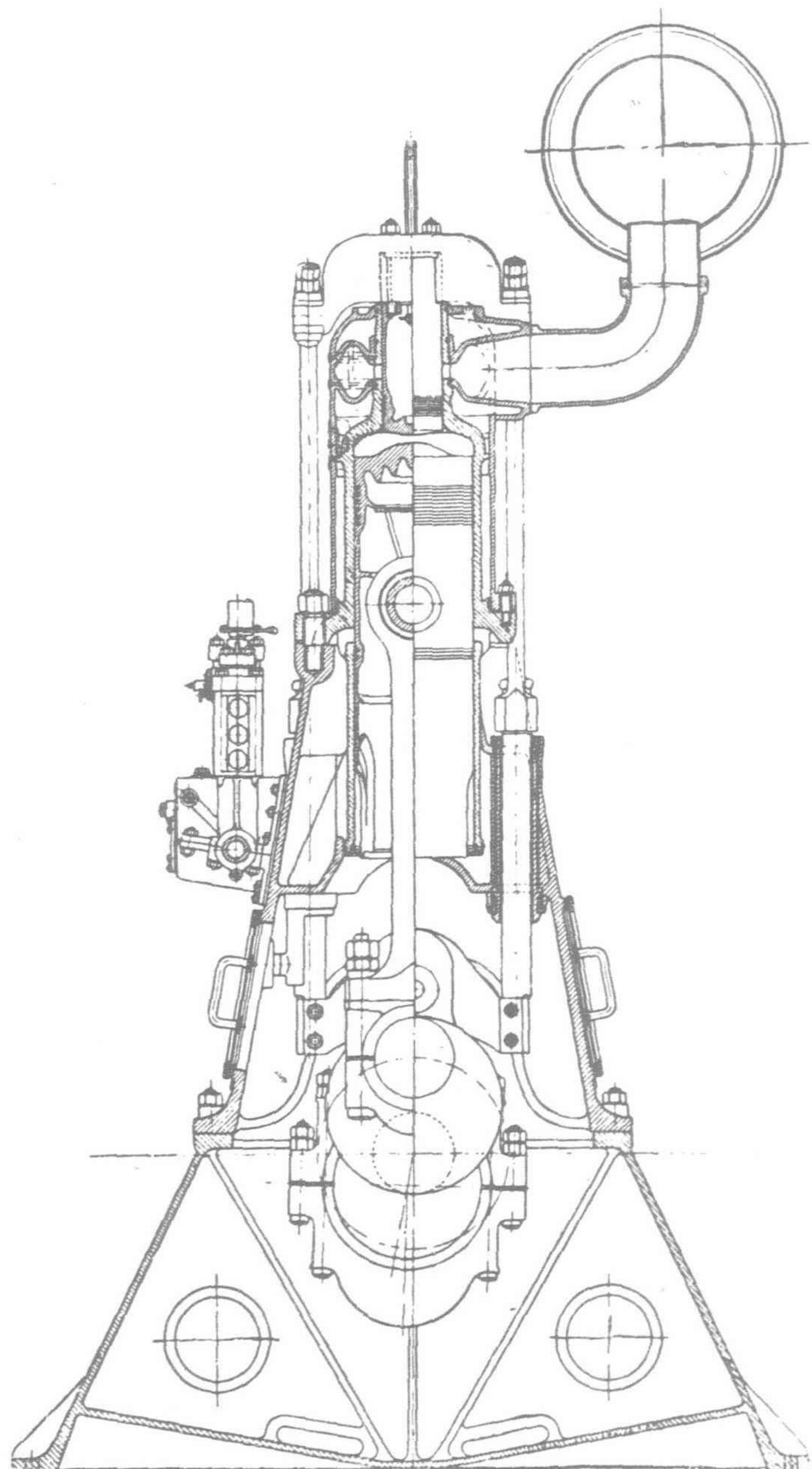
The new B. & W. double-acting two-stroke engine is specially adaptable for single screw vessels of 4,000 to 7,000 S.H.P.

The first vessel fitted with this type of engine is the East Asiatic Company's vessel *Amerika* which has already been launched from the B. & W. Shipyard in Copenhagen, and which will be put into service at the end of this year.

The ship is 490 feet long with a beam of 62-ft. and a depth of 40-ft. On full draught of 28-ft. 3-in. she carries 11,600 ton D.W.

The engine has six cylinders of 620 m/m diameter and 1,400 m/m stroke, and develops at full power 7,000 S.H.P. at 100 revs., which will give the ship a speed of about 15 knots.

The weight of the engine is 360 tons and the total weight of the Diesel machinery all included is 940 tons.



Section Through B. & W.'s Single-acting Two-stroke Diesel Engine

This is equivalent to only .0515 Tons per S.H.P., constituting the lightest commercial type of slow running Diesel engine yet developed.

The ship is built for the trade from Europe through the Panama Canal to the west coast of America, and back, and is fitted with refrigerated holds for carrying fruit.

This type of double-acting two-stroke engine may be used in the future as propelling machinery for twin-screw or quadruple-screw large passenger vessels of 40,000 to 50,000 H.P. In ships where the engine-room is restricted to under the main deck, the two-stroke engine of same type can be built single acting.

Modern Airless Injection

The various Diesel engine manufacturers have for many years experimented with airless injection and a few have used this type of injection, but the results have in the most cases not been fully satisfactory, mainly due to the fact that the atomizing was carried out with mechanically operated fuel valves.

B. & W. constructed experimental airless injection engines as far back as 1903-4. The results were fairly good, but comparatively inferior to those obtained by using blast air. During the last three to four years B. & W. have succeeded in constructing a fully satisfactory airless injection system by the use of automatic

(Continued on page 203).

Solid-Injection Double-acting Two-stroke Diesel Engines

By Dr. HELLER, Berlin

ON the 18th of February, the M.A.N. Company invited a number of prominent European engineers to their Augsburg Works to be present at the tests on the first of the solid-injection double-acting two-stroke marine Diesel engines built by this firm. The engine in question is one of six which the Yokohama Dockyard Co. is installing in three of their ships, and of which two have already been built in Japan by the Dockyard Co. itself under a licence agreement with the M.A.N. Works. The principal data of these engines, which are all of the 6-cylinder type, are as follows:

Bore	..	..	..	..	..	600 mm. (23.7 in.)
Stroke	..	..	..	..	..	900 mm. (35.5 in.)
Speed	..	..	..	..	..	130 r.p.m.
Break horse-power	..	..	..	..	..	3,600—3,750 H.P.

The scavenge air is supplied partly by special, electrically driven blower sets and partly by piston pumps directly incorporated in the engines.

The simplification in design and the reduction of the necessary attendance consequent upon the progress that has been made, thanks, in particular, to the adoption of solid injection for large engines of this kind, will be evident from a comparison of Figs. 1 and 2, which show respectively a marine Diesel engine of the solid-injection type (Fig. 1) and one in which compressed-air injection is employed (Fig. 2). The cam shaft, shown in (Fig. 2,) extending throughout the whole length of the machine, and the rods for actuating the inlet valves are now dispensed with. A centrifugal governor, which limits the admissible speed of the engine, is driven from the center of a short horizontal shaft. The fuel pumps, which, as in all M.A.N. engines, are arranged in the form of separate units for each particular cylinder and cylinder end, are located at either end of this shaft in two groups, each of six pumps, in order to obtain as simplified a lay-out as possible. In addition to the open fuel jets—to the number of one per upper, and two per lower, cylinder end—there is now only one safety valve and one automatic starting valve on the cylinders, so that there is no necessity for any control mechanism driven by the engine. To operate the reversing device, start under compressed air, and adjust the fuel admission, it is only necessary to turn a single hand wheel. At the commencement of the turning motion, compressed air is admitted into an oil reservoir connected with the reversing cylinder. The piston of this reversing cylinder produces the necessary movements in their correct sequence for reversing the fuel pumps: first the driving levers of the pump pistons are lifted of the corresponding cams; then the common driving shaft of the fuel pumps is axially displaced, by which movement also the cams, located on the same shaft, for actuating the pneumatically controlled starting valves, are displaced; and finally the driving levers are replaced on the cams for the new direction of rotation. It could be observed in the tests that these operations followed in fairly quick succession.

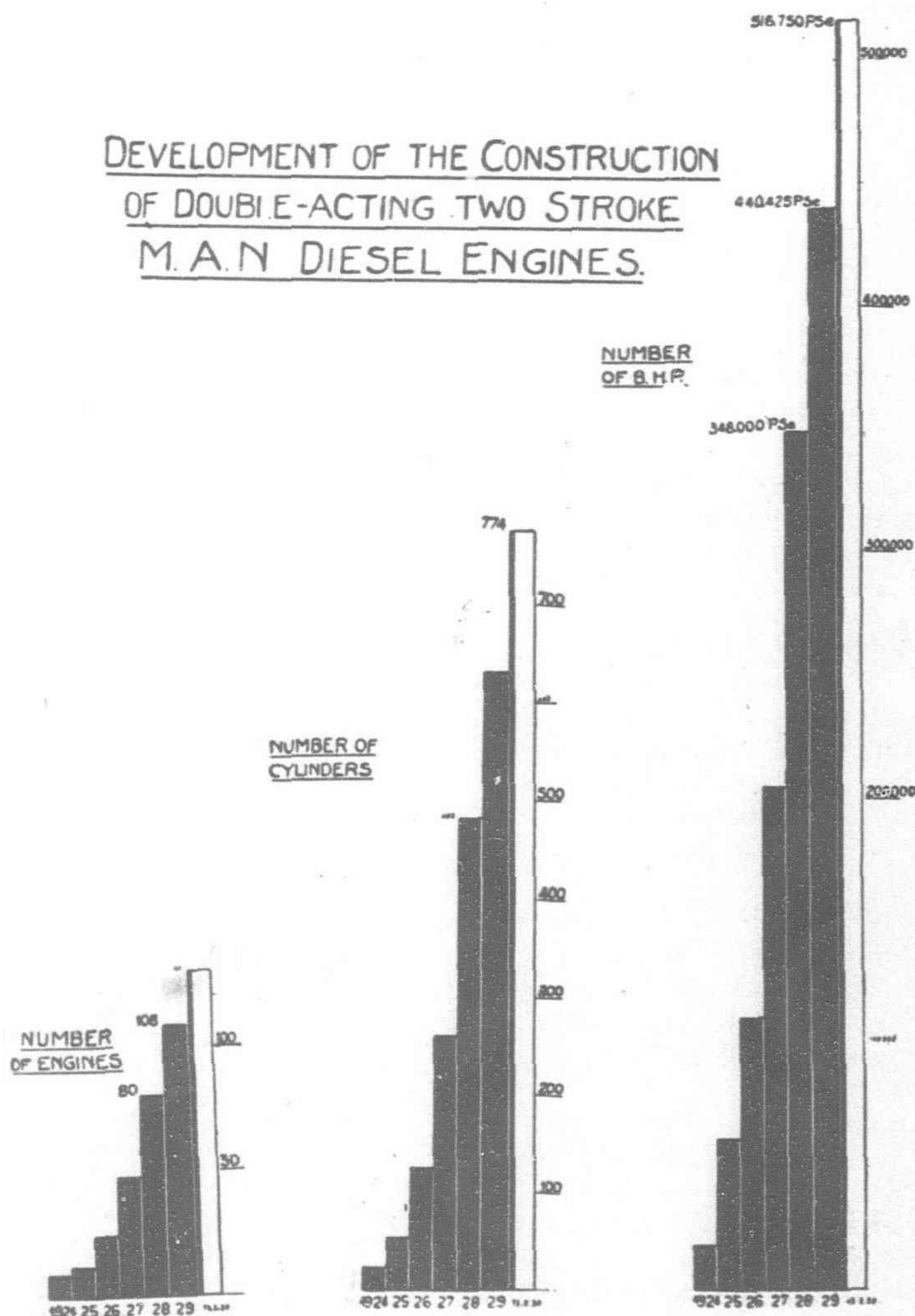
The M.A.N. scavenging process, which is protected by patents in Germany as well as most foreign countries, merely employs slots in the cylinder wall both for the exhaust and for the admission of the scavenge air, so that no valves of any kind are necessary. Its method of operation is as follows: the exhaust and scavenge slots are arranged on the same side of the cylinder and occupy about half its periphery. The scavenge slots are so shaped that the current of air is first of all blown tangentially along the bottom of the piston, where it is deflected and made to flow along the opposite cylinder wall to the cylinder cover. Its course is then reversed the air being turned in the opposite direction towards the exhaust slots and through these out into the open. The current of scavenging air expels the exhaust gases out of the cylinder and cleans the latter so completely that pure air is available at the commencement of the compression period for the succeeding power stroke. This process is termed reverse-scavenging from the nature of the scavenging process. It has the special advantage that very satisfactory scavenging of the interior of the cylinder is obtained by the use of a very low scavenging pressure.

In its preliminary run the engine was very quiet; even at speeds of 40 to 50 r.p.m., the firing was quite regular—a conclusive proof of the excellent results given by the reverse-scavenging process. The results obtained are all the more remarkable as only a few days were available for the preliminary tests and for preparing for, and carrying out, the acceptance tests. The reversing operations were performed equally smoothly except in a few instances, where some slight trouble was experienced owing to certain parts sticking, but only minor adjustments were necessary to overcome this trouble.

The adoption of solid fuel injection for so large outputs represents an important stage in the development of double-acting two-stroke Diesel engines, the possibilities of which the M.A.N. Company was the first to recognize and put into practice some years ago, though, since then, other firms have developed Diesel engines along the same lines. In a comparatively short interval of time it has been possible to reduce the originally considerable height of these engines by fundamentally altering the entire design, as well as substantially to facilitate installation in ships by modifying the design of the cylinder liners. Compared with an earlier type possessing the same cylinder dimensions and with air injection, the height of the engine has been reduced from 8,345 to 7,450 mm. (27.5 to 24.5-ft.) and the necessary erection space from 12,500 to 11,000 mm. (41 to 36-ft.).

This progress in design has recently led to an appreciable increase in orders for double-acting two-stroke Diesel engines. At present 21 engines of this kind for marine applications are under construction at the M.A.N. Works. The number of cylinders of 600 mm. (23.7 in.) bore and 900 mm. (35.5 in.) stroke, on which work is in progress for double-acting two-stroke engines, totals 140, thus allowing of series manufacture. The total output of double-acting two-stroke engines built by or under construction at the M.A.N. Works and its

DEVELOPMENT OF THE CONSTRUCTION
OF DOUBLE-ACTING TWO STROKE
M.A.N DIESEL ENGINES.



M.A.N. DIESEL ENGINES FOR NEW JAPANESE MOTOR SHIPS

Under Construction by the Yokohama Dockyard

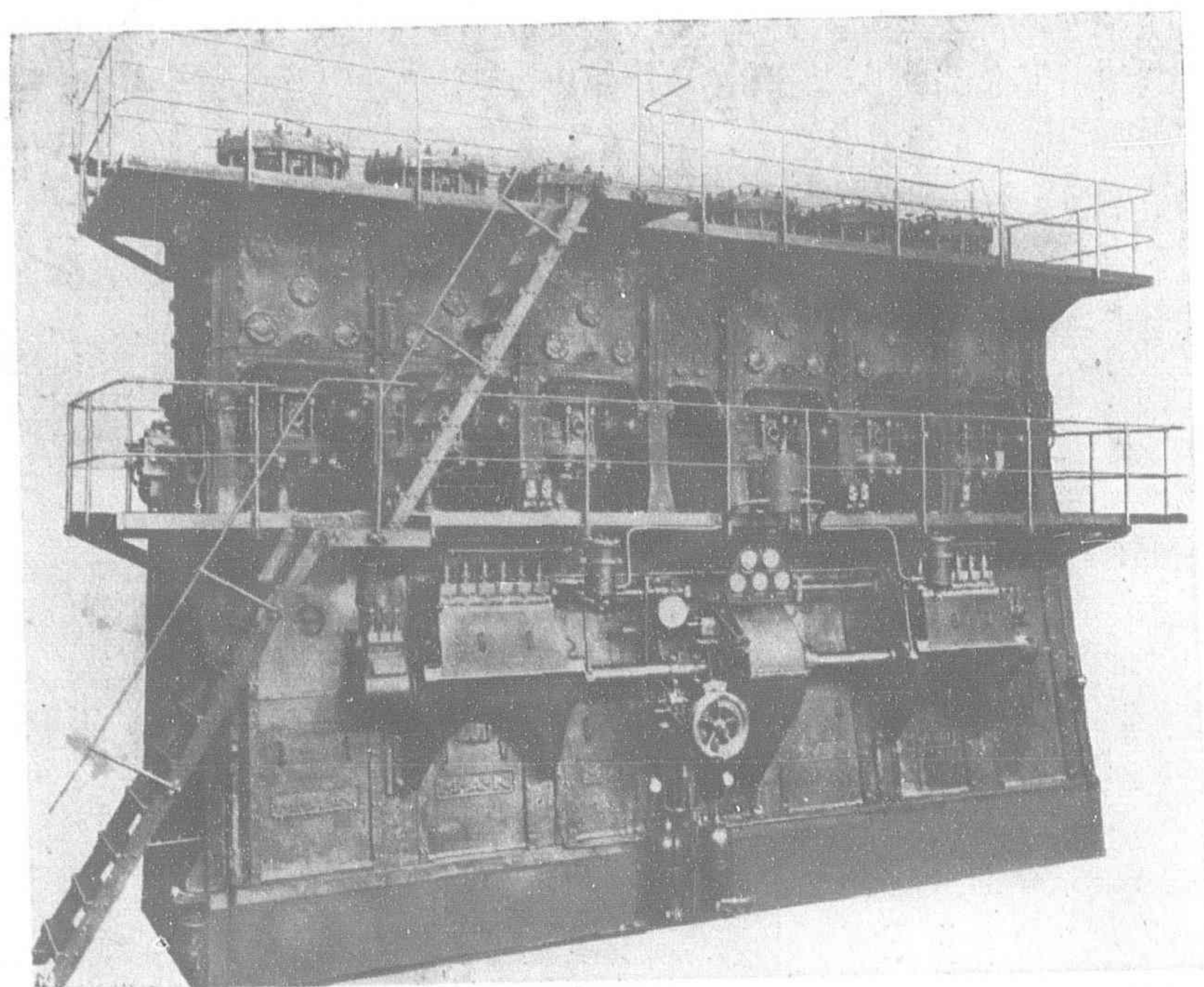


Fig. 1.—A-B; Solid Injection Double-Acting Two-Stroke M.A.N. Marine Diesel Engine

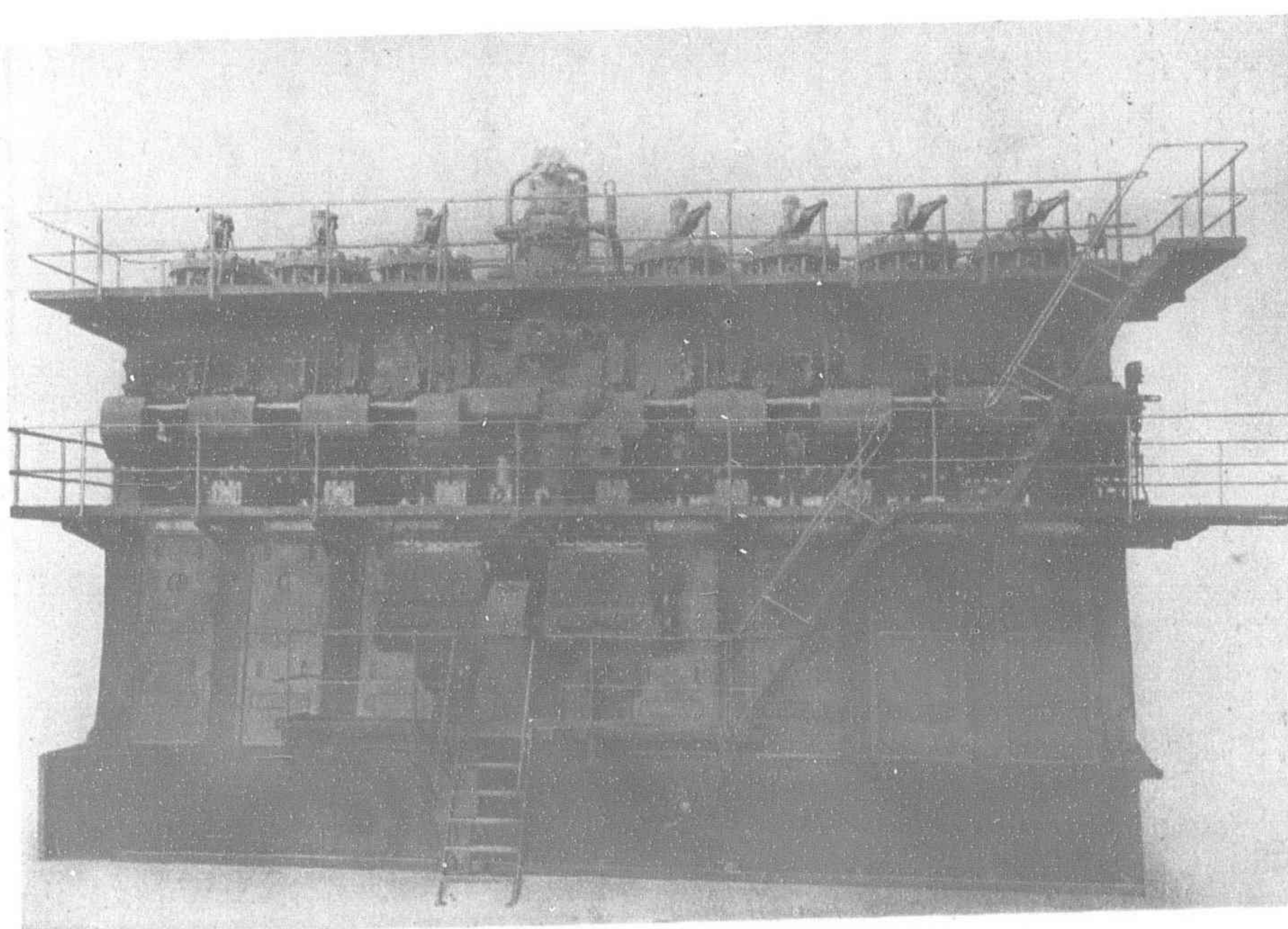
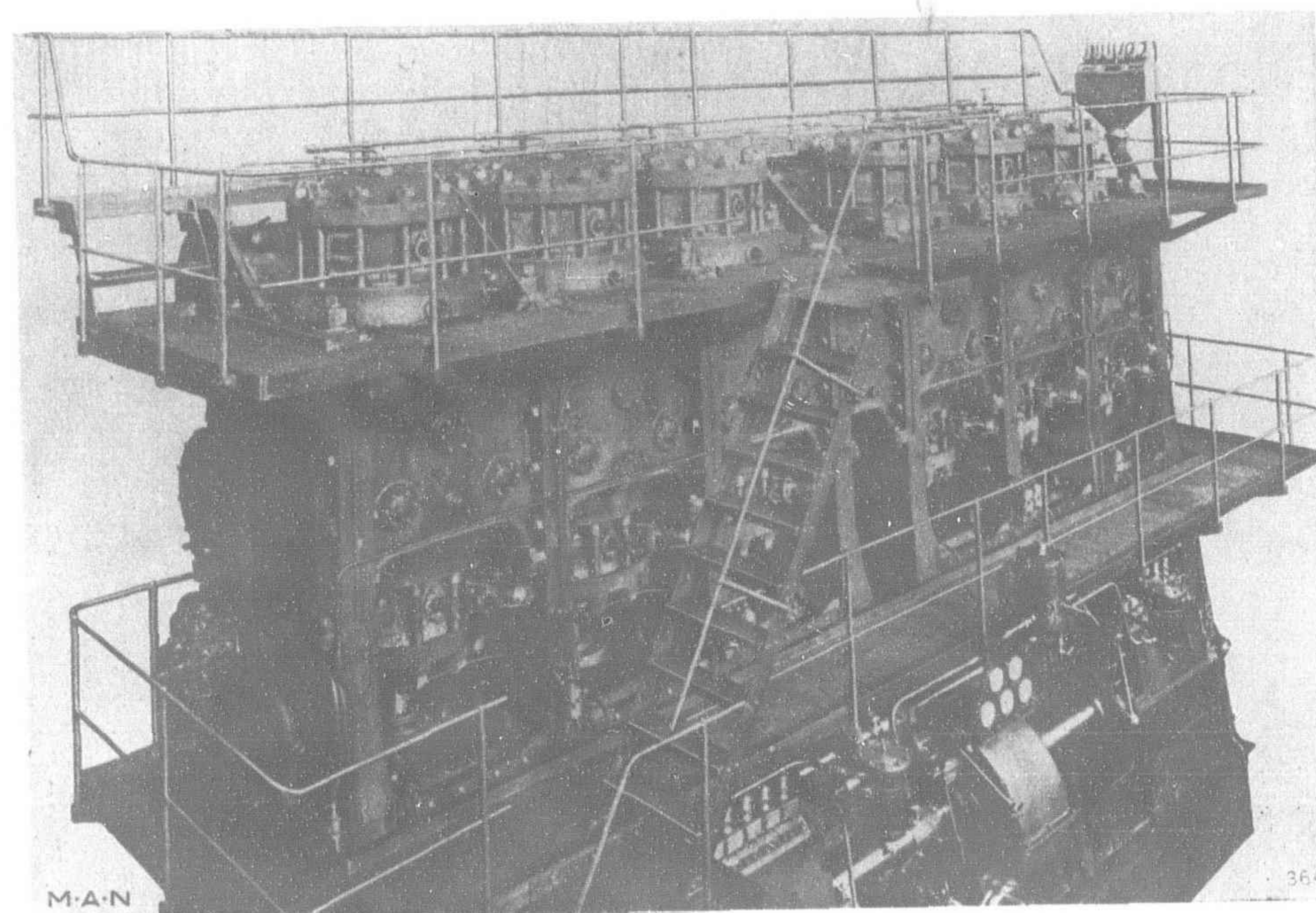


Fig. 3.—Double-Acting Two Stroke M.A.N. Marine Diesel Engine with Air Injection

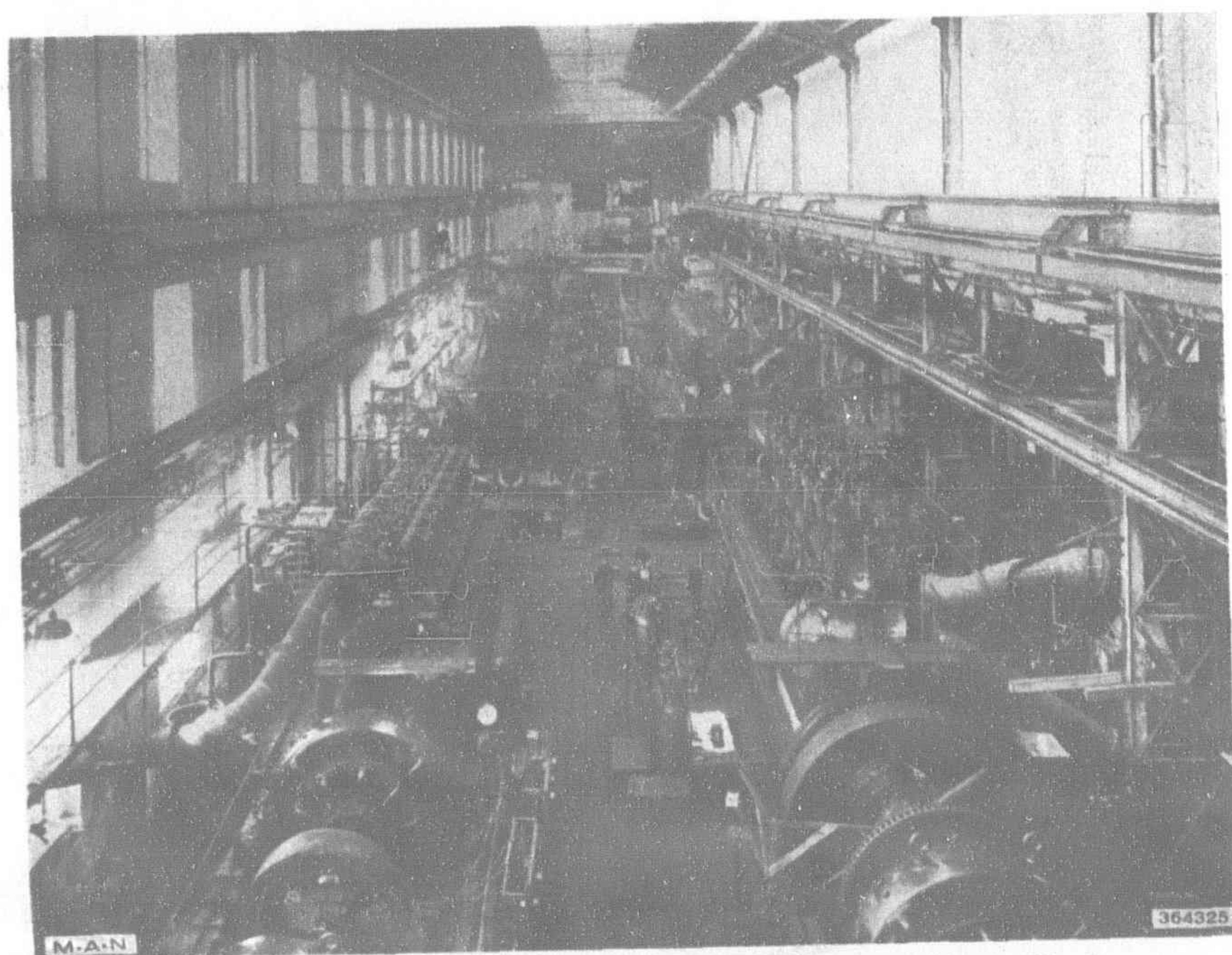


Fig. 4.—Testing Bay for Diesel Engines at the M.A.N. Works

licence holders has increased from 348,000 HP at the beginning of 1929 to about 520,000 HP at the commencement of February, 1930, the corresponding figures relative to the number of engines being respectively 80 and 130, as indicated in the diagrams given in Fig. 3.

In addition to the cross-head type of double-acting two-stroke Diesel engines, single-acting four-stroke Diesel engines of the plunger type for outputs of 60 to 2,400 HP likewise form a branch of manufacture at the M.A.N. Works. The production of these engines, which all operate on the principle of airless injection and may be adapted comparatively easily to various fields of application, has been improved during recent years by organizing manufacture in such a way that assembled and tested, with the result that the majority of engines when assembled complete can leave the Works without having to be previously run up in the testing bay (see Fig. 4). The usual types of high-speed Diesel engine for vehicles are equipped for the most part with Bosch fuel pumps. The employment of these engines as stationary units for driving automatic emergency lighting or pumping plants would appear to offer distinct possibilities.

The Latest Developments of the B. & W. Diesel Engine (Continued from page 200).

fuel valves and cam-driven fuel oil pumps, one for each cylinder, and are now building airless injection engines on a large scale. The airless injection system means a great simplification of the engine, and the fuel oil consumption is about 10 per cent. less per B.H.P. than for the blast air injection system.

In connection with the airless injection system B. & W. are constructing a new type of supercharge blowers driven mechanically from the shaft of the main engine or separately by electromotor. The same type of blowers are used as scavenging blowers for the B. & W. two-cycle engines.

The mechanical driven supercharge blowers are much to be preferred to exhaust driven supercharge blowers, because the latter increase the back pressure of the exhaust from the engine, and as the B. & W. blowers are running only about 300 revs. per minute the reliability is far superior to exhaust driven or electromotor driven turbo-blowers of 3,000 to 5,000 revs. as used by other builders of marine Diesel engines.

In this way the power of the B. & W. type of four-cycle engines is increased by about 40 per cent. and at the same time the length of the main engine and thereby the length of the engine room is reduced by the elimination of the air-compressor.

The B. & W. airless engines are eminently satisfactory for stationary engines, and the following plants are in service:

B. & W. electric power works	..	..	1,100 B.H.P.
Ronne Electricity Works	..	..	1,200 "
The Copenhagen Free Port	..	..	1,400 "
The Copenhagen Sewage Station	..	..	625 "

The following ships are in service fitted with airless injection main and auxiliary engines:

Name	Owner	In Service	Speed	D.W.	G.T.	I.H.P.	R.P.M.
<i>Aegir</i>	Den Islandske Re-gering, Reykjavik	June 1929	13½	215	470	1,300	180
<i>C. F. Tietgen</i>	United Steamship Company, Copenhagen	Dec. 1928	14½	942	1,850	2,450	145
<i>Esbjerg</i>	do.	Apr. 1929	15½	1,524	2,762	4,250	200
<i>Tensan Maru</i>	Dairen Kisen Kai-sha, Dairen & Kobe	May 1929	10½	4,000	2,740	1,650	140
<i>Sensan Maru</i>	do.	June 1929	10½	4,000	2,740	1,650	140
<i>Konsan Maru</i>	do.	Aug. 1929	10½	4,000	2,740	1,650	140
<i>Rosan Maru</i>	do.	Sept. 1929	10½	4,000	2,740	1,650	140
<i>Infanta Christina</i>	Compania Trasmediterranea, Barcelona	July 1929	17	2,000	4,500	6,300	190
<i>Altube Mendi</i>	Sotary Aznar, Bilbao	July 1929	15	3,800	2,965	1,550	125
<i>Aya Mendi</i>	do.	Aug. 1929	15	3,800	2,954	1,550	125
<i>Ulster Monarch</i>	HARLAND & WOLF, Belfast Steam Ship Co., Ltd., Belfast	Apr. 1929	18	920	3,760	7,500	170

Among these ships particular interest is attached to the performance of the Motorship *C. F. Tietgen* which may be compared with the steamship *S/S København*, both belonging to the United Steamship Company and running on the same route. The figures speak for themselves.

	<i>S/S København</i>	<i>M/S G. F. Tietgen</i>
Main dimensions	269' 3" x 39' 11" x 17' 0"	270' 0" x 40' 11" x 17' 0"
Draught loaded	15' 7"	15' 9"
Gross tonnage	1,670 tons	1,850 tons
Displacement	2,604 "	2,685 "
Deadweight	908 "	900 "
Space taken up by engine room	59,500 cub. ft.	51,200 cub. ft.
Brake Horsepower about	2,000	2,050
Total weight of machinery about	450 tons	320 tons
Engine room staff	12	7
Number of 1st and 2nd class passengers	243	282

On my way to Japan I stopped in Belfast for the technical trial trip of the *M/S Agamemnon* built by Workman Clark for the Blue Funnel Line, the Diesel engines being built by B. & W. in Copenhagen. The method of propulsion is twin-screw and each main engine has eight cylinders of 740 m/m by 1,500 m/m stroke. The engines are airless injection and fitted with high pressure supercharge, or as it now usually is called, high pressure induction air, supplied by blowers of Rateau's make. The power developed during the trial was 10,000 B.H.P.

The length of the engine-room is only 54-ft. and compared with the twin-screw motorship *Tantalus*, built in 1923 for the same owners and fitted with B. & W.'s blast air engines of the same number of cylinders of same diameter and 1,150 m/m stroke, the horsepower guaranteed at that time was 4,500 B.H.P. and the length of the engine-room was 63-ft.; the new ship shows a reduction of 9-ft. in length of engine-room and a doubling of the horsepower, which illustrates the phenomenal development of the B. & W. Diesel engine during the last six years.

One set of similar machinery is under erection in Caledon Shipyard, Scotland, and three new sets of engines of same type and size are under construction by B. & W. for three sister-ships all for the Blue Funnel Line. The three new sets will be fitted with mechanical driven blowers of the B. & W. type for high pressure induction.

A most interesting ship has been ordered by the "Bergenske Steamship Company" for the express passenger service Bergen-Newcastle. The ship is under construction at the Elsinore shipyard in Denmark, the Diesel machinery being built by B. & W. The machinery is twin-screw, with ten cylinder trunk piston engines, and high pressure induction air mechanical driven B. & W. Blowers. The total horsepower will be 10,000 S.H.P. at about 160 revs. and the speed on trial is guaranteed at 19½ knots. The total weight of the engine plant is 1,100 tons.

The engine plant of this ship and that of the East Asiatic Co.'s *M/S Amerika* are outstanding examples of the latest development of the B. & W. Diesel engines.

New N.Y.K. Motor Passenger Vessel "Chichibu Maru" (Continued from page 198).

BANK.—Another new feature on the *Chichibu Maru*, as on her sister ships, is the establishment of a branch office of the Sumitomo Bank aboard the ship. The function of the Sumitomo office is the exchange of money, cashing travellers' cheques, remittances, etc. It has already proved a great success on the *Asama Maru*. The bank opens every day except on Sundays. If, however, Sunday falls on the day before, or on the day of, the arrival at port, for the convenience of the passengers, the office will open in spite of the above ruling.

SECOND CLASS ACCOMMODATION.—It is needless to state that the superior appointment of the Public Rooms and the excellent passenger accommodation are not limited only to the first class, but are extended to the second class as well.

EISLER, REEVES & MURPHY

FED. INC., U.S.A.

CONSULTING ENGINEERS

MARINE & CARGO SURVEYORS

3 CANTON ROAD, SHANGHAI.

SURVEYORS TO:

AMERICAN BUREAU OF SHIPPING
(AMERICAN LLOYD'S)

TEIKOKU KAIJI KYOKAI
(THE IMPERIAL JAPANESE MARINE
CORPORATION)

REGISTRO NAVALE
LOCAL UNDERWRITERS

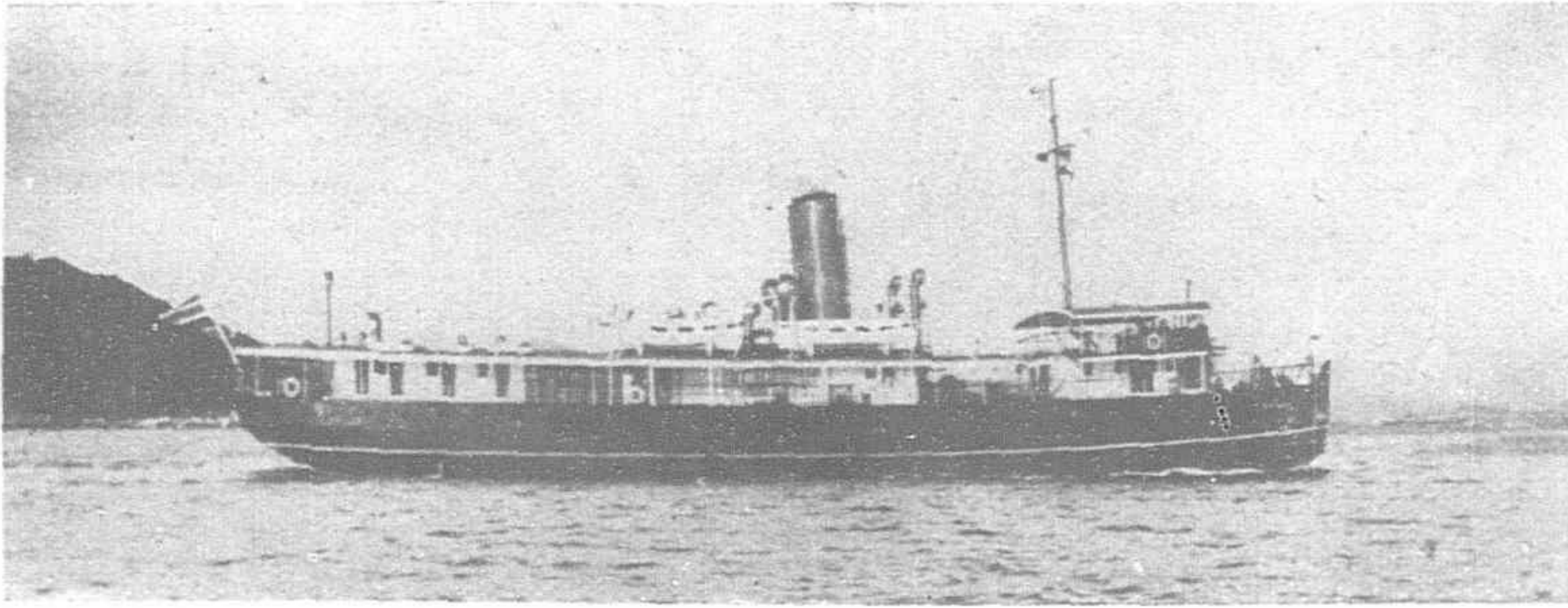
INTERNATIONAL UNION OF MARINE INSURANCE

FAR EAST SUPERINTENDENCE CO., LTD.

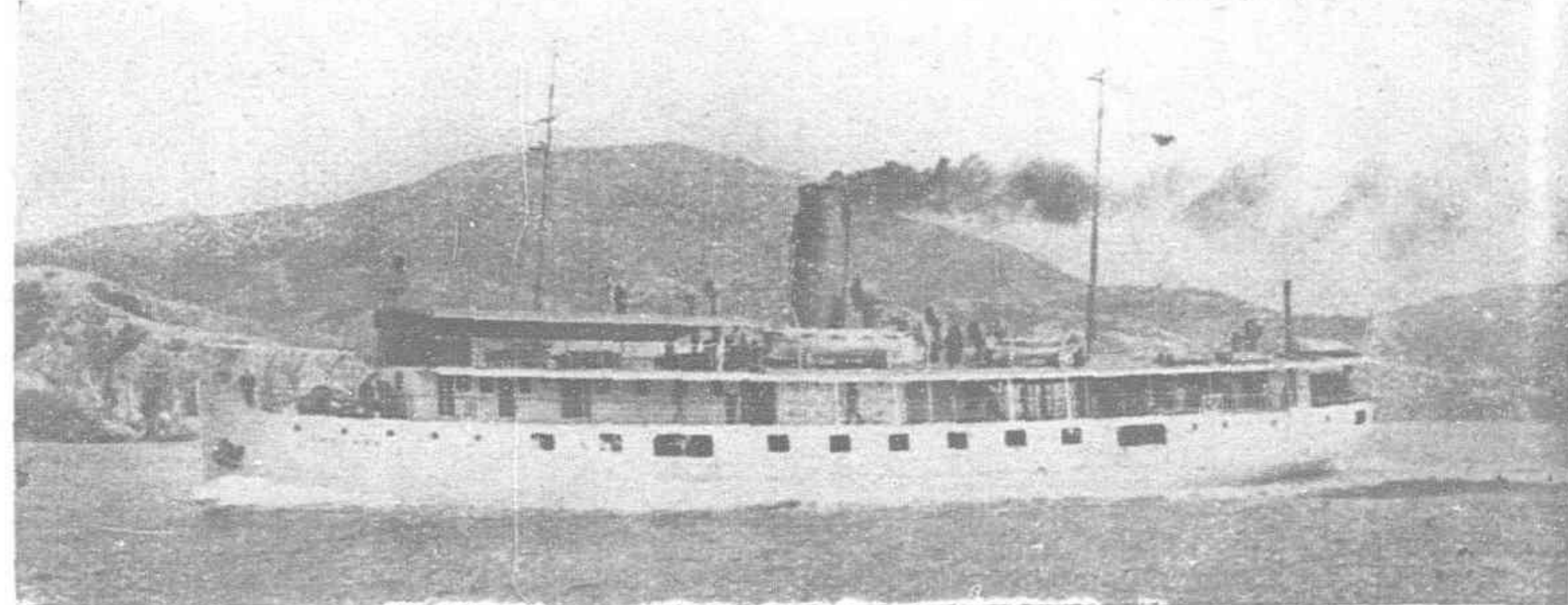
UNITED STATES SALVAGE ASS., INC.

AMERICAN STEAMSHIP OWNERS P & I ASS'N

AMERICAN CONSULATE GENERAL



S.S. "Naris," Steel Single Screw Steamer; Dims, 165-ft. B.P. by 35-ft. by 9-ft. Mld.; Speed 10.5 Knots I.H.P. 650 D.W. 336 Tons



S.S. "Thalang," Steel Single Screw Steamer; Dims. 165-ft. B.P. by 35-ft. by 9-ft. Mld.; Speed 11.3 Knots I.H.P. 7.31 D.W. 225 Tons

Shipbuilding in Hongkong

Activities of the Hongkong & Whampoa Dock Company, Ltd.

OUT of a total of sixteen vessels launched at the Kowloon yards of the Hongkong & Whampoa Dock Company, Ltd., during 1929, seven were equipped with Diesel engines, five with motors furnished by various manufacturers, and four with engines made by the Dock Company. The advent of motor shipbuilding in the Colony and the importation of motors for propulsion resulted in curtailing the activities of the engine-building department of the Works to an extent that the management is seriously considering the advisability of engaging in building marine motors in order to maintain the efficiency and continued prosperity of the enterprise. The launchings for 1929 included :

- 8 Passenger and Cargo Motor Vessels for the Philippines.
- 2 Coasting Steamers for Bangkok
- 1 Motor Water Boat
- 1 T.S. Steel Motor Towing Launch
- 1 Steam Launch
- 1 Sea-going Steam Towing Launch
- 2 Motor Lighters
- 2 Steel Dumb Lighters.

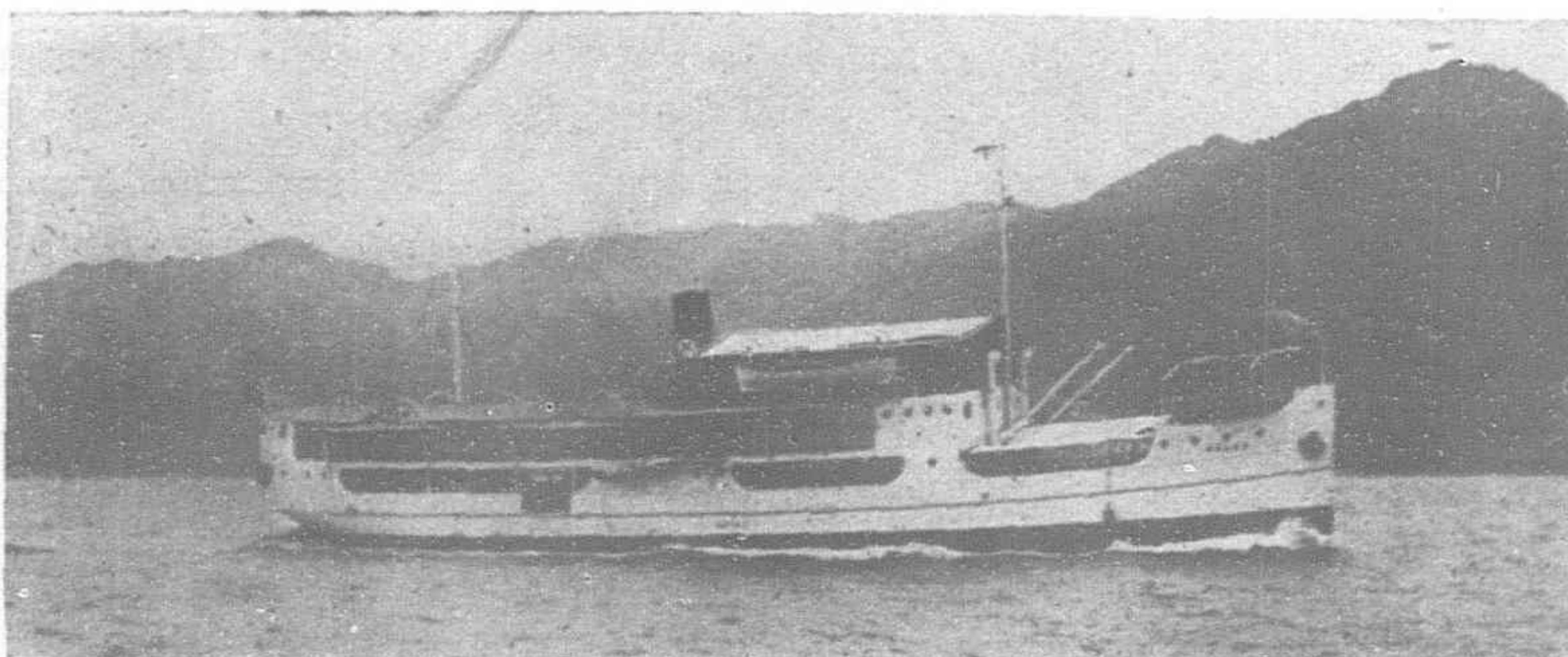
The names of the above vessels, with their tonnage, horsepower and make of engines follow :

Name of vessel	Type	Port of Reg.	Gross Tons	I.H.P.	Makers of Engines
<i>Sugbo</i>	S.S. Pasgr. and Cargo Motor	Cebu	405.62	360 B.H.P.	"Benz" Motors.
<i>Fu Ping</i>	S.S. Sea-going Steam Tow-Launch.	Hongkong	287.79	730 I.H.P.	H. K. & W. Dk. Co., Ltd.
<i>Naris</i>	S.S. Steel Coasting Steamer.	Bangkok	799.07	650 I.H.P.	do.
N.A. No. 100	Steel Dumb Lighter.	Hongkong	145.00	—	—
N.A. No. 101	do.	do.	145.00	—	—
<i>Tai Yee No. 2</i>	S.S. Steel Motor Water Boat.	do.	189.88	152 B.H.P.	"Gardner" 4J8 Marine Engine.

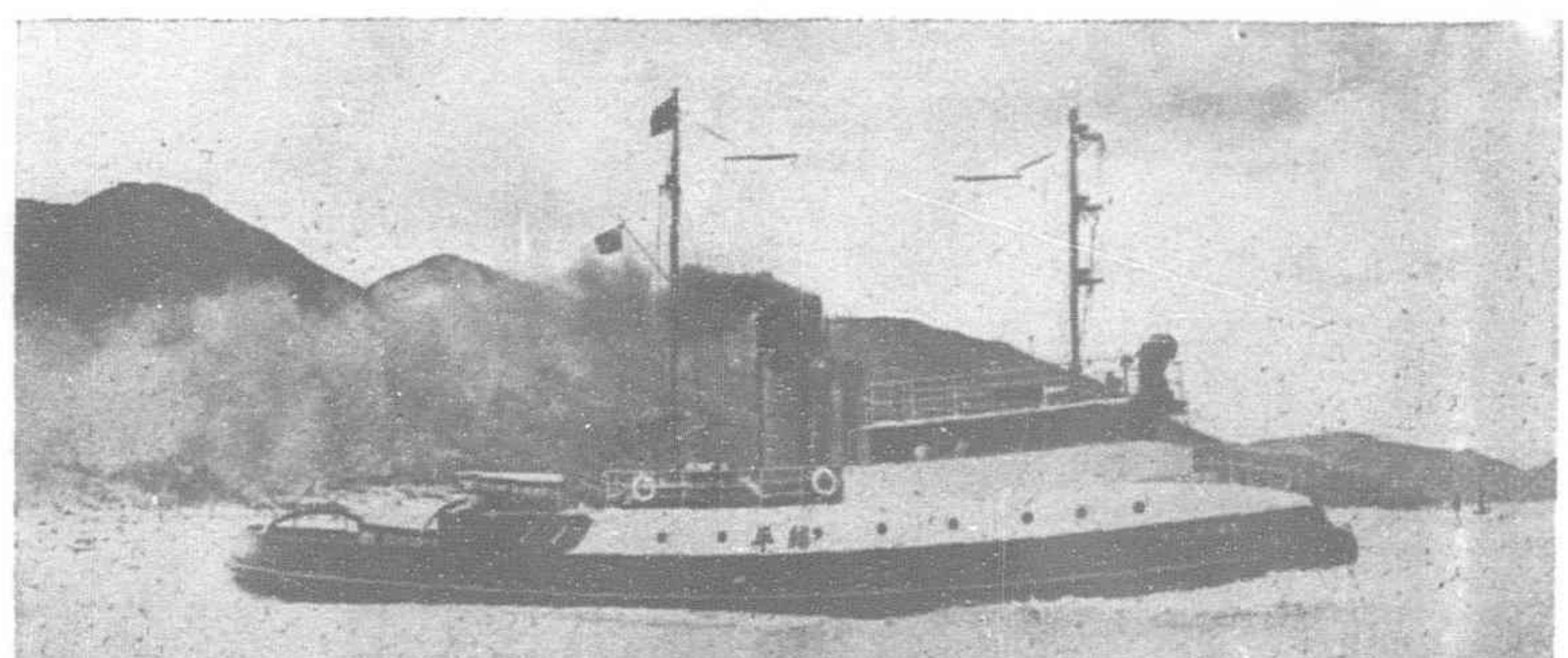
<i>Kolambucan</i>	S.S. Pasgr. and Cargo Motor Vessel.	Cebu	700.00	600 I.H.P.	"Sumner" Semi-Diesel Motor.
<i>Rizal</i>	do.	do.	740.00	700 B.H.P.	"Atlas" do.
<i>Petreux I.</i>	T.S. Steel Motor Towing Launch.	Hongkong	37.96	96 B.H.P.	"Gardner"
<i>Hai Tung</i>	S.S. Teakwood Steam Harbour Launch.	do.	41.45	80 I.H.P.	H. K. & W. Dk. Co., Ltd.
<i>Thalang</i>	S.S. Steel Coasting Steamer.	Bangkok	800.00	650 I.H.P.	do.
<i>Governor Taft</i>	S.S. Pasgr. and Cargo Motor Vessel.	Cebu	250.00	330 B.H.P.	"Deutz" Full Diesel
<i>Bohol</i>	do.	do.	250.00	330 B.H.P.	do.
<i>Manok Lachtray</i>	do.	do.	250.00	330 B.H.P.	do.
	T.S. Steel Bulk Benzine Mtr. Lighter.	Haiphong	150.00	150 B.H.P.	"Kromhout" 2X2 M3 Mtr.
<i>Cuacam Princessa</i>	do.	do.	150.00	160 B.H.P.	do.
	S.S. Pasgr. and Cargo Motor Vessel.	Cebu	400.00	575 B.H.P.	"Deutz" Full Diesel.
<i>Lustevaco</i>	do.	Manila	200.00	225 B.H.P.	"Union" Full Diesel.

5,941.77

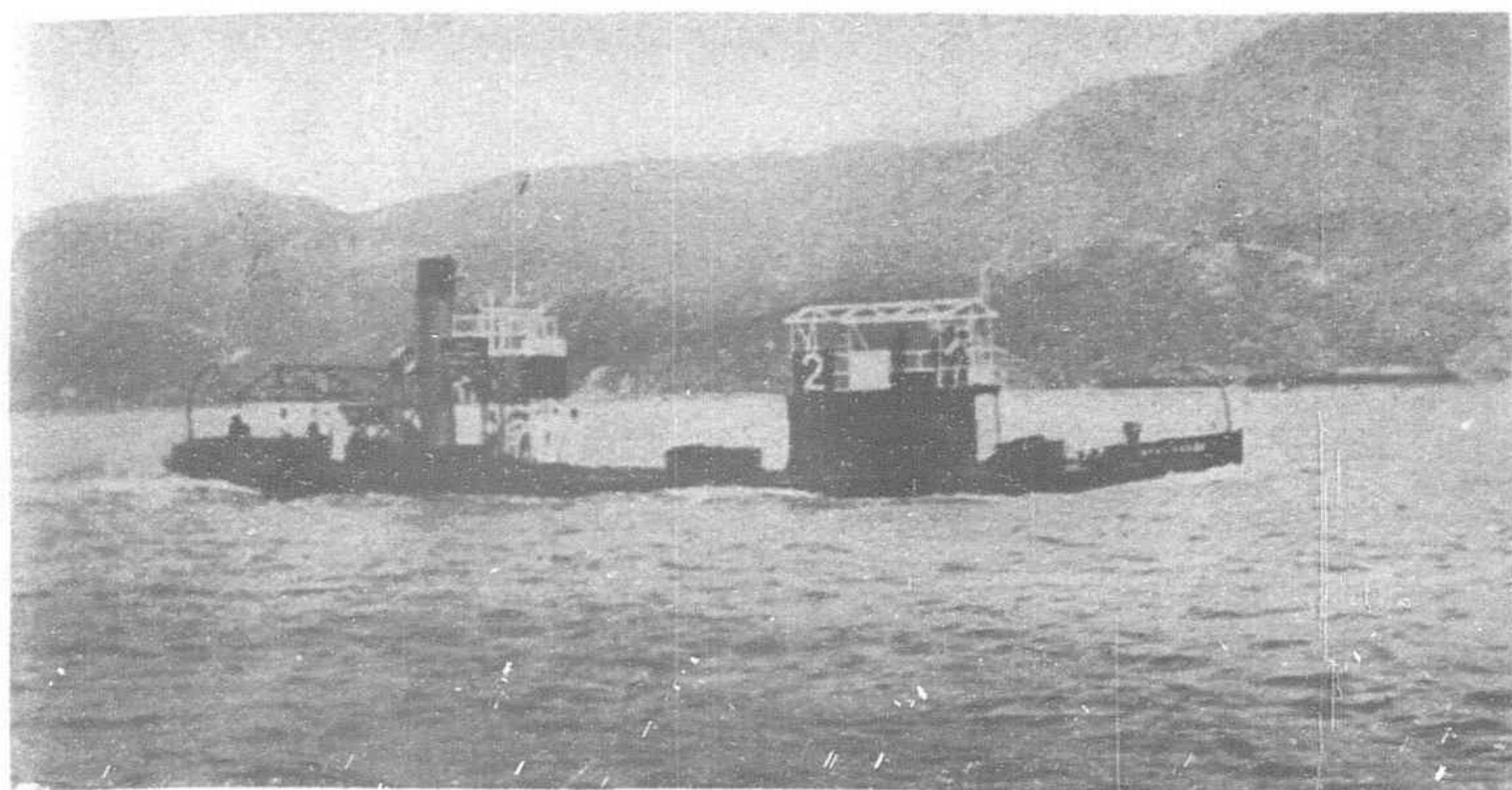
The above showing of less than 6,000 tons in new launchings for the premier British shipbuilding plant in China reflects the general depression resulting from unstable conditions and the interference with trade in this country. The annual balance-sheet for 1929 shows a gross profit of \$653,832 (an increase of \$280,000 over the previous year) but after deducting interest, taxes, Crown rents, insurance, and directors' fees, and allowing the sum of \$148,834 for depreciation, the net profit was only \$614. This, added to the amount brought forward from last year (\$121,381), makes the Profit and Loss Account \$121,995, which has been carried forward to next year. The directors were obliged to pass the



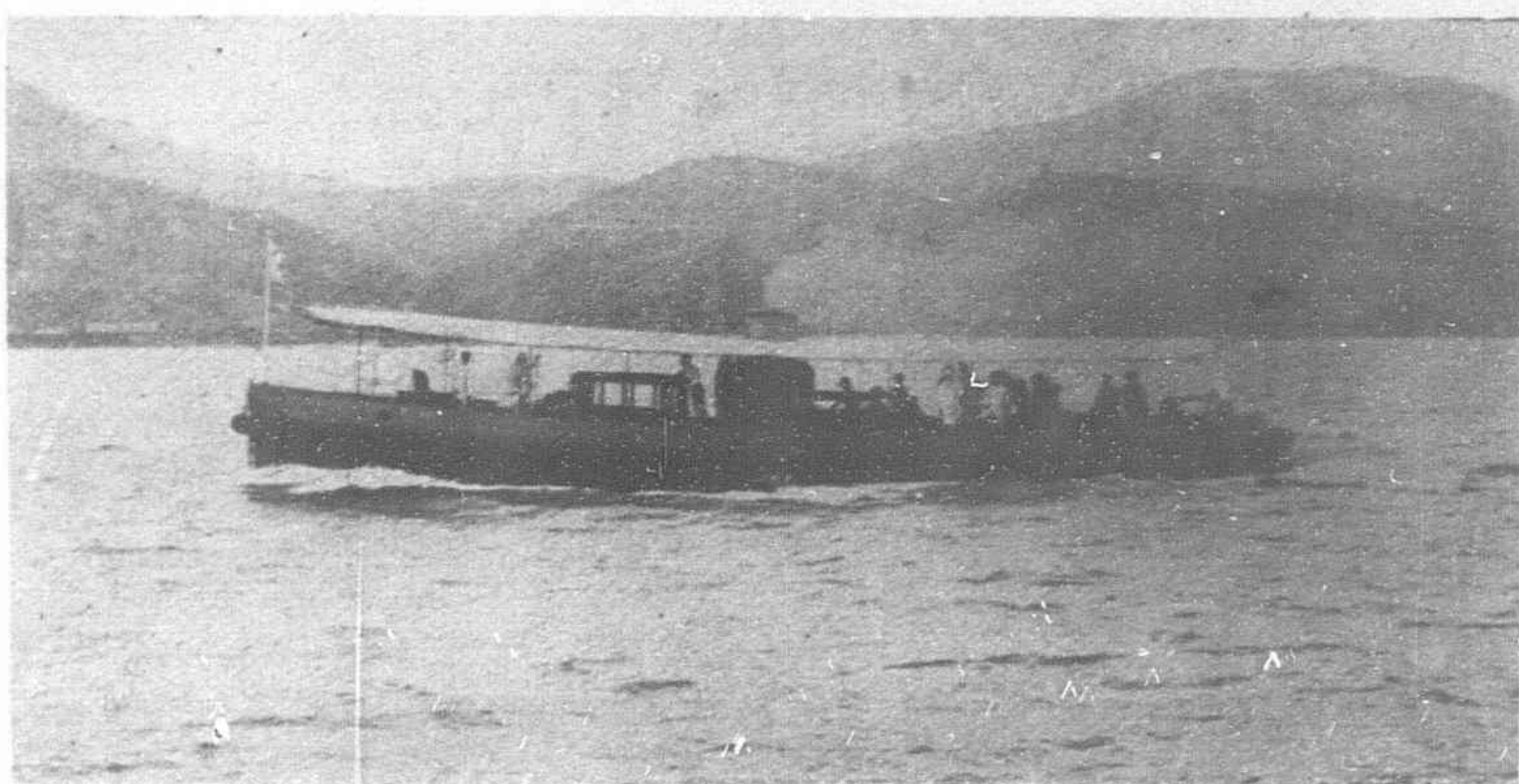
S.S. "Fu Ping," Steel Single Screw Sea Going Tug; Dims. 110-ft. B.P. by 25-ft. by 11-ft. Mld.; Speed 11.5 Knots I.H.P. 700 D.W. 183 Tons



M.V. "Sugbo," Steel Single Screw Motor Vessel; Dims. 154-ft. B. P. by 28-ft. by 11-ft. 6-in. Mld.; Speed 10.4 Knots B.H.P. 360 D.W. 470 Tons



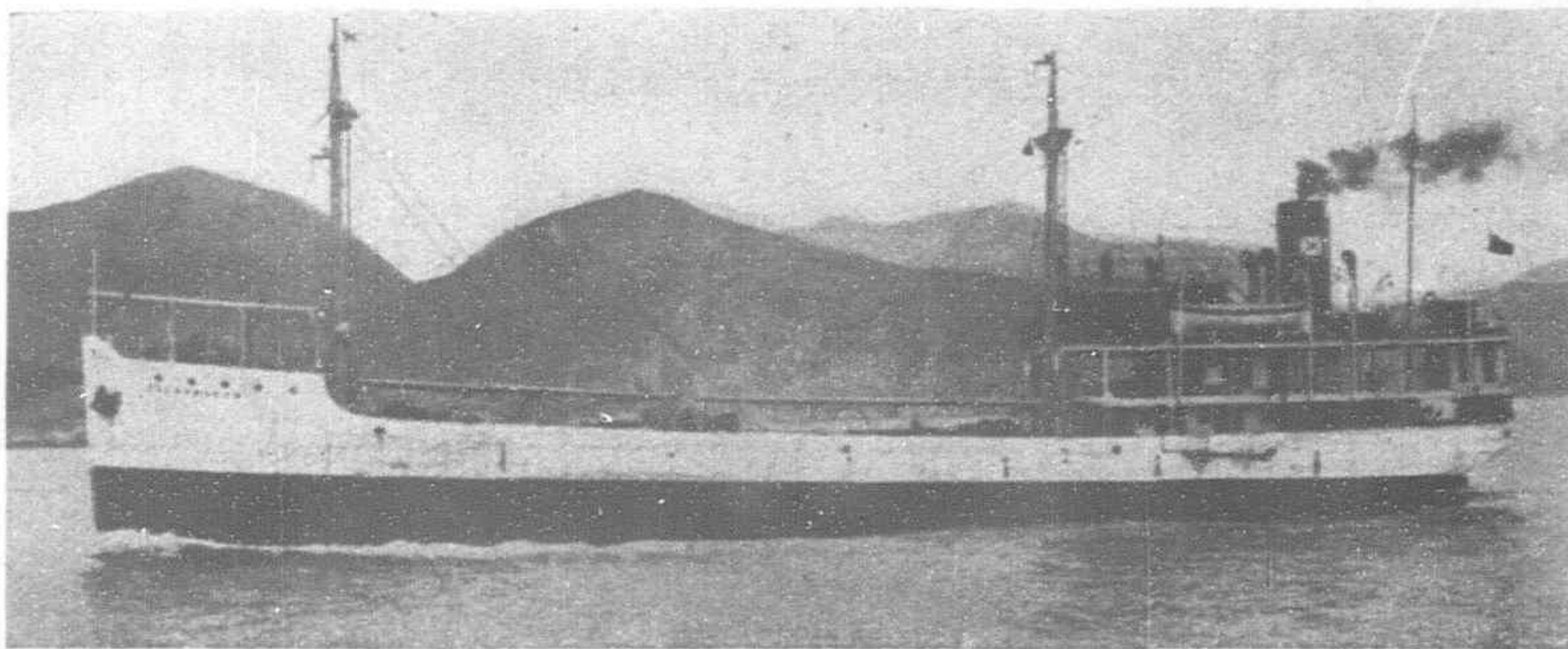
M.V. Tai Yee Ho"; Steel Single Screw Motor Water Boat; Dims. 105-ft. B.P. by 22-ft. by 10-ft. Mld.; Speed 7.31 Knots B.H.P. 140 D.W. 335 Tons



M.V. "Petreux I"; Steel Twin Screw Motor Launch; Dims. 71-ft. B.P. by 15-ft. by 5-ft. Mld.; Speed 9.15 Knots B.H.P. 96

usual dividend looking forward to the increased business that is hoped will follow the stabilization of political conditions in China.

Since the first of this year three vessels have been launched in Hongkong, of which two have proceeded from the ways of the Kowloon yards and the other from the Taikoo Dockyard. The two vessels from the Hongkong & Whampoa Dock Company are the *Governor Taft* and the *Manok*, sister ships, of a gross tonnage of 275.3 each and a net tonnage of 162.11. The *Manok* was built to the order of La Naviers Filipina of Cebu and the *Governor Taft* for the P. D. Navigation Company of Manila, and are to be used for the inter-island trade. The Kowloon Docks are also completing four more vessels for Philippine shipping firms; the *Rizal*, a 500-ton motor vessel for La Naviera Filipina; the *Bohol*, sister ship to the *Governor Taft* and the *Manok*; the *Princesa*, a 406-ton motor vessel for the Insular Navigation Company; and the *Lustivico*, a 200-ton motor vessel for the Luzon Stevedoring Company of Manila.



M.V. "Kolambugan"; Steel Single Screw Motor Vessel; Dims. 180-ft. B.P. by 30-ft. by 14-ft. 6-in. Mld.; Speed 8.77 Knots B.H.P. 600 D.W. 940 Tons

Launch of the "Yungan"

On March 15 the motor vessel *Yungan* was launched at the yards of La Societe Franco-Chinoise de Constructions Metalliques et Mecaniques in Natao. This vessel is a sister ship to the *Yungping* which was fully described and illustrated in the March number of THE FAR EASTERN REVIEW. It was built for the same owners, the Dah Zung Steam Navigation Company, for the Shanghai-Haichow service.

The *Yung An* is a passenger and cargo vessel of 1,500 tons capacity, 230-ft. long, 35 ft. beam, and draught fully loaded, 11-ft. Fitted with wireless, she carries two Diesel motors, each of 500 horse-power, supplied by the M.A.N., which give her a speed of 11 knots. She will have passenger accommodation for 12 first-class passengers, 48 second and 250 third. The *Yung Ping* and *Yung An* are to-day the two most modern units of the Chinese commercial fleet.

Blue Funnel Line Development

It will be of interest to readers of the *Far Eastern Review* especially those who are travelling or contemplating travelling in Europe, to note that the Blue Funnel Line (Messrs. Alfred Holt & Company), who are the owners of one of the largest privately owned fleets in the world, and whose passenger vessels have particularly comfortable accommodation, have recently decided to cater for tourists desirous of visiting the South of France and Egypt.

For the first time in their history, one of their passenger steamers has called at Marseilles on her outward voyage to China and Japan. This was the twin-screw 10,000 ton liner *Aeneas* which sailed from the Mersey on January 4 and inaugurated the call at Marseilles, where she was joined by Mr. R. D. Holt, (ex-chairman of the Mersey Docks and Harbor Board, and principal of the Blue Funnel Line,) bound on a world tour.

The Blue Funnel Line maintain a monthly service to China and Japan, and the introduction of these pleasure cruises for tourists will give travellers a delightful sea voyage to Marseilles, then a fortnight's stay in the pleasure and health resorts of the South of France, joining the homeward steamer of the same Company bound for London, thus completing the holiday in 25 days including 12 days at sea. The return fare for the journey to Marseilles and back, including expenses in the south of France, does not exceed

the cost of a first class British hotel for the same period, i.e., £25 return fare, which allows the tourist, should he so desire, to travel overland one way by train. These cheap tickets are interchangeable with those of the Bibby Line which maintains a fortnightly service from Liverpool to Marseilles, returning to London. During the summer months, from April to September, the return fare is reduced to £22, with the same overland travelling facilities. The sea passage from Liverpool to Marseilles is about 5½ days.

Also during the summer months the Blue Funnel Line have arranged for a scheme of sea travel, which will make a very strong appeal to those desiring a few weeks relaxation from business. This is a trip to Egypt by the company's passenger vessels from Liverpool and back to London, the whole trip only occupying 25 days, giving three to four days stay at Port Said, and enabling the tourist to visit Cairo, or even to travel as far afield as Palestine and Jerusalem. By travelling overland to and from Marseilles, the holiday will only occupy a day or two over a fortnight. The return fare by sea all the way is the modest sum of £35, or if the tourist desires to join or leave the vessel at Marseilles £31. The tickets for the excursion are interchangeable with the Bibby Line P. & O., Orient, and British India companies, but there is a slight additional passage money payable in the vessels belonging to the three last named companies.

Engineering Notes

ELECTRIC LIGHT, POWER AND TRACTION

ELECTRIC WINDING ENGINES FOR JAPANESE COLLIERIES.—Electric winding engines have recently been installed at the Okinoyama, Kamiyamada, and Tadakuma collieries in Japan, all being of the twin-rope haulage type. At the Okinoyama pit the shaft is vertical and only 310-ft. deep. The motor, which runs at 360 r.p.m., normally develops 355 h.p. and drives the actual winder at 43 r.p.m. through spur gearing. The winding speed is 1,240-ft. per min., and with four tubs per cage 382 tons of coal per hour can be raised. At the Kamiyamada mine the vertical shaft is 1,350-ft. deep. The motor in this case has a normal output of 1,220 h.p. at 54 r.p.m. and is directly coupled to the winder. The winding speed is 2,580-ft. per min., the lifting capacity being 150 tons per hour. The working conditions at the Tadakuma mine are somewhat different to those at the other two pits. In this case haulage is effected along an incline at an angle of 45 deg. to the horizontal. The coal is filled underground into a skip, which is hauled to the surface along a rail track, an empty skip descending at the same time. When the loaded skip arrives at the pit head, its contents are discharged into a hopper by means of special tipping mechanism, the coal being then carried by band conveyors to the washing plant, the sorting equipment, etc. The motor, which normally develops 290 h.p. at 350 r.p.m., drives the winder at 29.3 r.p.m. through spur gearing, 120 tons per hour being raised along the 1,320-ft. hoisting track. All three sets of plant are controlled on the Ward-Leonard system; however, to equalize the severe load fluctuations inevitable in winding operations a heavy A.E.G. Ilgner-system flywheel is coupled with the Ward-Leonard motor-generator.

HUGE BAIKAL POWER PROJECT.—Professor Alexandrov, the engineer of the Dnieper Hydro-Electrical Station, now under construction, has advanced a new project involving the building of a power station on the rapids of the Angara River, in the basin of the Lake Baikal.

The Angara Station when completed will, according to Professor Alexandrov, be able to yield 20 milliards of kilowatthours per annum, ten times as much as the Dnieper station, this electrical energy to be the cheapest in the world.

Like the Dneprostroy, the Angara station will combine the production of energy with the creation of a number of powerful industries, particularly those of colored metals.

The problem of the Angara station is connected with a number of other problems, such as the development of the production of Molybden and Wolfram steel, the exploitation of extensive forests, the development of agriculture on an area of 10 million hectares, and the construction of great railways, the most important of which will connect Verkhneudinsk, Siberia, with Ulan-Bator (Urga), Outer Mongolia, eventually to be continued to Peiping, for the purpose of exporting timber into Mongolia and China.

The colored metal combine, when completed, will be able to produce 150,000 tons of zinc, 50,000 tons of lead and 30,000 tons of copper.

The Angara project is being considered by the Soviet Government in connection with the general plan for development of Siberia.—*Tass*.

INDUSTRIAL

COAL LIQUEFACTION IN JAPAN.—At the Imperial Fuel Research Institute and the Naval Fuel Research Station nearly every kind of coal produced from Chosen, Hokkaido, Karafuto and Joban districts has been studied in respect to its suitability for hydrogenation and it has been found that some kinds of Chosen coal are best. The Chosen Chiso Hiryo K.K. has decided to make a large scale experiment, and has

requested a further study of the subject by the Imperial Fuel Research Institute. At the same time, the company has studied the hydrogenation apparatus on a commercial scale, and a patent was procured last year in the name of the Nippon Chiso Hiryo K.K., a sister concern of the aforementioned company. Satisfied by the results, the company has announced that it will erect an experimental plant on a semi-commercial scale in north Chosen, and this plant will be completed by the autumn of this year. It is also learned that the Mitsubishi Mining Company, which owns enormous electric power resources in North Chosen, has decided to use its surplus power for the liquefaction of coal.

NEW GREEN ISLAND CEMENT PLANT.

—An entirely new plant is to be installed at the Hok Un works of the Green Island Cement Co., Ltd., at a cost of approximately £270,000 sterling.

The troubles of our technical staff in regard to old machinery, will, however, soon be removed for as you have been informed at the extraordinary general meeting. The new plant has been purchased from Messrs. Vickers, Armstrongs, Ltd., and is to be ready for operation before the middle of next year. The kilns, machinery, etc., will all be of the very latest design and of British workmanship throughout. With the new plant installed and operating, the Green Island Cement Company will be able to market its product at rates enabling it to compete successfully in every market open to us.

The whole plant will be electrically driven and with current supplied under a five year contract by China Light & Power Co. (1918), Ltd.

CEMENT SALES COMPANY FORMED BY LARGE FIRMS.

—A plan providing for the establishment of a large joint cement sales company a capitalization of Y.5,000,000 has been drafted and submitted to a general meeting of the Japan Cement Association. The company will consist of 15 Portland cement companies, including the Asano, Onoda, Iwaki, Chichibu, Oita, Hokoku, Ube, Osaka Ceramics, Nanao, Nippon, Mikawa, Electro-Chemical, Toa, Tosa and Asahi.

All cement products for consumption in Japan Proper will be sold through this company. exports come under this category. The head office will be located in Tokyo. The company's directors will be selected from among those of 15 companies and the term of its existence 10 years.

U. S. FIRM TO BUILD FACTORY IN KOREA.

—A Y.6,000,000 plant for the manufacture of corn products is being erected in Korea by American interests. Mr. E. L. Phillips, is en route to Heijo, Korea, where he will supervise construction of the new factory for the H. K. Ferguson Company. The new plant is to be owned by the Nippon Corn Products Company Limited, which is affiliated with the Corn Products Refining Company of New York, with Mr. E. T. Bedford of New York as President. The plant, which will be completed by the middle of next year, will cover a total area of 15 acres.

RAILWAYS

LIGHT RAILWAY FOR ASHIHO.—The Chamber of Commerce and the local gentry of Ashiho (Achenghsien), a city about 26 miles southeast of Harbin, have undertaken to construct a light railway, approximately 28 miles long, to connect the city with Lalin. The construction expenses which are estimated at \$5,000,000 will be advanced from the funds of a corporation to be organized by the interested merchants specially for the construction of the proposed line.

NEW LOCOMOTIVE FOR SOUTH MANCHURIAN RAILWAY.—The South Manchurian Railway Co. has ordered from Sulzer Brothers a Diesel-electric shunting locomotive. It will be driven by a Sulzer eight-cylinder four-cycle Diesel engine, developing 750 B.H.P. at 650 revs. per min. The locomotive will be built for normal gauge (4-ft. 8½-in.), and mounted on two four-wheel driving bogies. The full output of the Diesel engine can be utilized up to a speed of about 25 miles per hour. The maximum speed for the locomotive alone is limited to 37 miles per hour. At a speed of 15 miles per hour the locomotive can exert a tractive effort of about 13,000-lb., i.e., at this speed it can pull a train of 40 trucks of 45 tons each along the level.

ANOTHER NEW RAILWAY.—The Tsi-tsihar-Keshan Line, approximately 204 kilometers in length, will soon be added to the railway system of the Three Eastern Provinces. The total construction cost of \$1,200,000 has already been appropriated from the Provincial Treasuries of Heilungkiang and Liaoning Provinces and also from the Peiping-Liaoning Railway Administration.

In addition to the main line, there will also be an extension running in a south-western direction to connect with the Taonan-Anganki Line at the Anganki Station.

Regular passenger and freight services are being maintained at present between Anganki and Taianchang, a distance of 127 kilometers, with rolling stock borrowed from the Peiping-Liaoning Railway. Peking-Mukden Line. The section from Taianchang to Keshan is still under construction and is expected to be completed before the end of the current year. It is estimated that transportation of agricultural products of the neighboring district alone, especially beans and kaoliang, will be sufficient to net a good profit for the new Line.—*Kuo Min*.

RAILWAY WORKSHOP FOR MUKDEN.

—A large railway workshop will be opened this year at Shenyang (Mukden) which will be equipped with machines for the manufacture of railway supplies and the repairing of locomotives for the various Railways in the North-East. The plans have been prepared by the North-Eastern Communications Committee, with the approval of the Ministry of Railways. The initial expenses for the proposed factory are estimated at one million dollars, which will be appropriated from the revenue of the various Chinese Railways in Manchuria. The site chosen for the factory is next to the North-Eastern University.

THE NEW TSITSIHAR-KOSHAN LINE.

—Both passenger and goods traffic on the Tsitsihar-Koshan Line has been opened as far north as Taianchen. It is 30 miles from Taianchen to Koshan, the terminus. The earthwork for the railway track is already finished, and work is being hurried with the intention to conclude it by next autumn.

With the total coolie immigrants from Shantung, etc., numbering 200,000-300,000 spreading themselves along the Tsitsihar-Koshan Line, each year, the bean production and trade will quickly increase, while Japanese sundries, too, are bound to find a larger market.

The plan to build an extension right through north to Heiho opposite Blagovestchensk will be a matter of the near future.

TO CONSTRUCT SHIUCHOW-PINGSHEK SECTION OF CANTON-HANKOW LINE.

—Surveying of the Shiuchow-Pingshek section of the Canton-Hankow Railway has been completed and construction work will be immediately started. The Ministry of Railways has remitted to the Canton-Hankow Railway Administration a sum of \$400,000 as initial construction expenses and will continue to remit \$200,000 monthly until the line is completed.

KIRIN-HAILUNG RAILWAY.—Construction of the Kirin-Hailunfu Railway, connecting Kirin, Provincial Capital of Kirin, and Hailunfu, in south-eastern Heilungkiang, has been completed. The new line is over 300 kilometers in length and is regarded as among the most important Chinese-owned railways in Manchuria. With the completion of the line, it is expected that development of the rich mineral resources in Manchuria will be greatly facilitated.

It is announced that the ceremony formally inaugurating the line will be held on June 1.—*Kuo Min.*

TSITSIHAR-HEIHO RAILWAY.—To facilitate the early completion of the projected Tsitsihar-Heiho Railway, the merchants of Aigun, Nunkianghsien and Nohohsien, three important cities lying between the two termini of the proposed line, have submitted a petition to the Heilungkiang Provincial Government recommending the issue of a loan to meet the necessary construction expenses, towards which the three cities concerned will undertake to subscribe to the extent of five million dollars (\$5,000,000).

It is pointed out that the proposed railway line will not only contribute to the effective defence of the eastern Heilungkiang border but will also give an impetus to the development of the rich mineral resources in the railway zone. The proposal has been forwarded by the Provincial Government to the North-Eastern Political Affairs Committee for approval.

SHIPPING AND SHIPBUILDING

THE JAPANESE PASSENGER LINER TATSUTA MARU.—The second of three similar 17,000-ton motor passenger vessels has been completed by the Mitsubishi Zosen Kaisha for the Nippon Yusen Kaisha's service between the Far East and California. This vessel, the *Tatsuta Maru*, is 560-ft. long with a beam of 72-ft., the depth being 42-ft. 6-in. She carries about 8,000 tons of cargo on a draught of 28-ft. 6-in.

Quadruple-screw eight-cylinder Sulzer-type machinery constructed under licence in Japan by the Mitsubishi Zosen Kaisha has been installed in this vessel. Each motor develops 3,875 b.h.p. at 120 r.p.m., and has cylinders 680 mm. bore with a piston stroke of 1,100 mm. The sea speed of the *Tatsuta Maru* is 19 knots, but according to telegraphic reports she made an average speed on trial of 20.3 knots, the maximum speed being almost 22 knots.

There is accommodation for 222 first-class, 96 second-class and 504 third-class passengers, the officers and crew numbering 330. For a full description of this class of vessel readers are referred to the December, 1929, issue of this journal.

THE FIRST B. AND W. DOUBLE-ACTING TWO-STROKE-ENGINE SHIP.—The *Amerika*, fitted with the first Burmeister and Wain double-acting two-stroke engine, was completed last month and sailed on her maiden voyage to the Far East. On her return she will be placed in the North Pacific service.

TWO SMALL JAPANESE MOTOR VESSELS.—Two 4,150-ton motor ships have been completed by the Mitsui Bussan Kaisha for the Dairen Kisen K.K. They are similar to the *Tensan Maru* and *Sensan Maru*, and are 325-ft. long with a beam of 46-ft. 5-in. and a depth of 21-ft. 5-in. B. and W.-type machinery constructed by the hull builders is installed, comprising a six-cylinder motor in each case. It develops 1,650 b.h.p. and has cylinders 550 mm. bore with a piston stroke of 1,000 mm. The names of the two new vessels are *Ronsan Maru* and *Konsan Maru* respectively.—*The Motor Ship.*

OSAKA SHOSEN KAISHA'S SHIPS.—The Osaka Shosen Kaisha will launch shortly its four semi cargo-boats which are now under construction. These four boats will be equipped with Diesel engines and will have a speed of 18 knots per hour. Their tonnage is more than 8,400 tons each.

One of the vessels will be completed shortly and will sail for Yokohama in the middle part of July to enter the Japan—New York service, for which the four boats are being constructed.

The first boat will be named as *Kinai Maru* the second will be called *Tokai Maru*, the third *Sanyo Maru*, and the fourth *Hokuriku Maru*.

PUBLIC WORKS

NEW YANGTSZEPPOO DOCK.—Plans are now under way for construction of a new city wharf on land in the vicinity of Yangtszepoo Road and the river by the Shanghai Municipal Council.

The proposed project, involving an expenditure of approximately Tls. 1,873,380, will provide increased public landing facilities. The plans include the building of a new wharf the construction of connecting roads, and the installation of necessary machinery.

The plans authorized the purchase of 76.196 mow of land in that district. It is said that the wharf proper will cover 36.169 mow, the remainder being given over to the proposed roads. Should the remaining 50 mow be in excess of the requirements of such road construction, the surplus will be retained to ensure a considerable reduction in the net ultimate cost of the wharf. This is suggested in view of the rapidly increasing value of land in the Yangtszepoo district.

The wharf will be 679 feet in length, as compared with 200 feet in the case of the Wayside Wharf. It will be utilized primarily for the discharge from lighters of cargo from steamers and from the Pootung side of the river.

NEW RESERVOIR IN MANCHURIA.—The new plan is to construct a reservoir large enough to have a supply capacity of 30,000 tons a day in Tashaho district, 17 miles north of Dairen, at the outlay of Y.10,000,000.

At present, the Wangchiatien Reservoir can give 10,000 tons a day, and the Lungwangtang Reservoir, on the Dairen-Port Arthur coast road, may supply 12,000 tons a day.

As to the daily consumption, the average for 1929 was 22,463 tons. The balance can be made up with the supply by the initial minor installations.

Supposing that the new Wangchiatien Reservoir will be completed in 1934, the total daily capacity will be 34,500 tons, barely sufficient to meet the quickly increasing consumption.

The new Tashaho site has been selected by the Water Source Commission and others of Kwantung Government after a careful investigation.

The water is to be conducted to Dairen by means of iron pipes.

TELEPHONE, TELEGRAPH AND RADIO

The Ministry of Communications is stated to have accepted a proposal from the Ministry of Posts of the German Government to inaugurate as soon as possible a wireless telephone service between Germany and China.

The Communications Ministry will also arrange for radio communication between China and the various European countries through the German radio station at Nauen, near Berlin. The completion of the arrangements, it is believed, will greatly facilitate transmission of messages between the Far East and Europe.—*Kuo Min.*

TELEFUNKEN STATION IN NANKING—A contract has been signed by the Central Government for the erection in Nanking of one of the most powerful radio broadcasting stations.

The radio station will be erected for the Government by the Telefunken Company of Berlin, represented by the Siemens China Co. It will be powerful enough to cover the whole area of the Chinese Republic as well as surrounding countries.

The transmitter plant will be erected near the Yangtze River and two 400-ft. self-supporting steel masts will be a conspicuous landmark of the capital in the near future. A power plant of 600 h.p. will render the broadcasting station independent of power supply from the city electricity works.

Y.40,000,000 PHONE IMPROVEMENT IN JAPAN.—Telephone communication between Tokyo, Okayama and waypoints will be made almost as easy as town calls by the completion in July of the construction work for the subterranean telephone trunk between the two cities, which has been going on during the past six years of a cost of approximately Y.40,000,000.

The trunk line has been installed throughout. What remains is the relay station at Himeji in which telephone engineers expect to overcome technical difficulties by the end of July at the latest. This will enable the Communications Office to open the trunk for service early in August.

One feature about this trunk is that by far, the greater part of it, which penetrates the rural districts, is carried by underground conduits which are laid parallel to the Tokaido and San-yo lines of the Government Railways, whereas in urban districts the trunk is carried overhead.

This is due to the fact that where linesmen can have easy access to the telephone wires in towns and cities, they would have considerable difficulty in adjusting or even locating anything that might go amiss with the rural lines, were they carried overhead. Since the rural lines are more susceptible to the elements than the urban lines, the Government has all the more reason for sinking them underground in the countryside.

Inasmuch as the increased distance means weakened sound, the Communications Office has established several amplifiers at way points, so that the communication between the two termini and way points can be heard with much clearness.

NEW WIRELESS STATIONS IN SZECHUAN.—Two new radio stations, one at Chengtu and the other in Chungking (Szechuan), installed by the Ministry of Communications, have recently been completed and are now open to the public for the transmission of messages. To further facilitate intelligence service in Szechuan Province and also between Szechuan and the neighboring provinces, preparations are under way for the construction of radio stations in other important cities.

MINING

GOLD MINING.—The initial expenses for the opening and development of several gold mines in the country, in accordance with the program of the Ministry of Agriculture and Mining, have been estimated at \$1,500,000.

Three Gold Mining Bureaux will be opened at an early date in the North-Eastern provinces for the purpose of prospecting the rich gold mine deposits in that part of the country. A detailed program, formulated by the Ministry of Agriculture and Mining, has been approved by the State Council. The Heiho Gold Mining Bureau will be established in Aigun, northern Heilungkiang. A similar bureau will be opened at Siwei also in Heilungkiang, while the third Bureau will be opened at Ilan, northern Kirin.

To facilitate the surveys, the outlying provinces will be divided into four main groups as follows:—

North-East: Shantung, Hopei, Jehol, Kiangning, Kirin and Heilungkiang.

South-West: Hunan, Szechuan, Yunnan, Kweichow, Sikong and Tibet.

Mongolian District: Inner and Outer Mongolia.

North-West: Kansu, Kokonor, and Sinkiang.—*Kuo Min.*

AVIATION

AVIATION FIELDS.—The Aviation Department of the Ministry of War is planning to construct a number of aviation fields in various important centers in the country to provide landing places for the Government airplanes. Among the first of such fields to be opened will be those in Yingchowfu (Anhui-Honan border), Chowkiakow (eastern Honan), Tsining and Tsaochow (southern and south-western Shantung), Kweichow (north-eastern Honan), and Lincheng and Ichowfu (south-eastern Honan).—*Kuo Min.*

SINO-GERMAN AVIATION CORPORATION PLANNED.—According to a Press report, negotiations are progressing here with certain German commercial aviation interests for the inauguration of a China-Germany Air Service. The proposed service will probably be operated by a specially organized corporation to be known as the Europe-Asia Aviation Corporation which will be a joint stock company of Chinese and German interests.

NANKING PLANNING FOUR ADDITIONAL AIR MAIL ROUTES.—After several months of investigation and preparation, the Ministry of War announced recently that plans for the operation of a number of air mail and passenger routes linking various important cities throughout the country have been completed by the Aviation Department of the Ministry under the direction of Captain Liu Pei-chuan, Commander of the 10th Aviation Corps.

The routes which will be operated in the order named, are as follow:—

Nanking-Yunnan Line: Starting from Nanking, the planes will stop at Nanchang (Kiangsi), Changsha, Hengchow (Hunan), Kueiyang (Kweichow), and terminate at Kunming (Yunnanfu).

Nanking-Shanghai-Canton Line: Starting from Nanking with stops at Shanghai, Ningpo, Yungchia, Foochow, Amoy, Swatow and terminate at Canton.

Canton-Hankow Line: Starting from Canton with stops at Shiuchow, Hengchow, Changsha, Yochow (Hunan) and terminate at Hankow.

Nanking-Canton Line: Starting from Nanking with stops at Nanchang, Ki-an, Nanhsiung and terminate at Canton.

Branch lines of the above main routes will also be operated as the need arises.

ORGANIZATION OF AIR MAIL BUREAU.—The State Council recently promulgated the Regulations governing the new National Air Mail Bureau of the Ministry of Communications. The Regulations define the functions of the new communication organ as follows:

1. To determine the aerial mail and passenger routes throughout the country.
2. To attend to all affairs pertaining to the air mail service.
3. To complete and carry out international air mail and passenger service arrangements.
4. To authorize and designate aviation interests in the undertaking of the management of the air mail service.
5. To supervise all preparations in connection with commercial aviation.
6. To be responsible for the engagement of aviators and other staff members attached to aviation interests undertaking air mail service.

ROADS

NEW HIGHWAYS FOR HUNAN.—The Reconstruction Department of the Hunan Provincial Government has outlined a program for highway construction for the province. It has been decided that ten main roads or provincial highways covering a total of 6,510 li and twenty branch roads or district highways covering 5,490 li are to be built within a period of five years. On the completion of these roads, the province will have a system of modern highways covering a total mileage of 12,000 li or nearly 4,000 miles.

KIANGSU-CHEKIANG ROAD.—The Kiangsu section of the Kiangsu-Chekiang Inter-Provincial Motor Highway from Chinkiang, provincial capital of Kiangsu, to the Chekiang border is to be completed within three months, according to a decision of the Kiangsu Provincial Government Committee yesterday. The Chekiang section of the highway is practically completed and it is hoped that long distance omnibus service between Chinkiang and Hangchow will be in operation in the summer.—*Kuo Min.*

TRADE NOTES

Oster Announces Additional Lines

The Oster Manufacturing Company, Cleveland, Ohio, U.S.A. announces that they have merged with the Williams Tool Corporation, Erie, Pa. This merger brings together two very well known lines of pipe and bolt threading equipment.

The Williams line consists of heavy-duty, high production pipe machines, which are equipped with the marvelous RAPIDUCTION die-head, for all sizes up to 18-in.; general purpose threading machines for 2-in., 4-in., and 6-in. pipe, and fast speed bolt threaders—single and double head.

The Oster Manufacturing Company, founded in 1893, is one of the pioneers in the export field, now maintaining sales offices in London, Arnhem, Stockholm, Buenos Aires, Calcutta, Sydney, Shanghai and Osaka. They are makers of the well-known Oster pipe machines and BULL DOG die-stocks.

For the present, no change will be made in the names of the two companies, however, the overseas sales activities have been united and will be directed from the Export Department at Cleveland.

SULZER

BROTHERS

SHANGHAI ENGINEERING OFFICE

Telegraphic Address

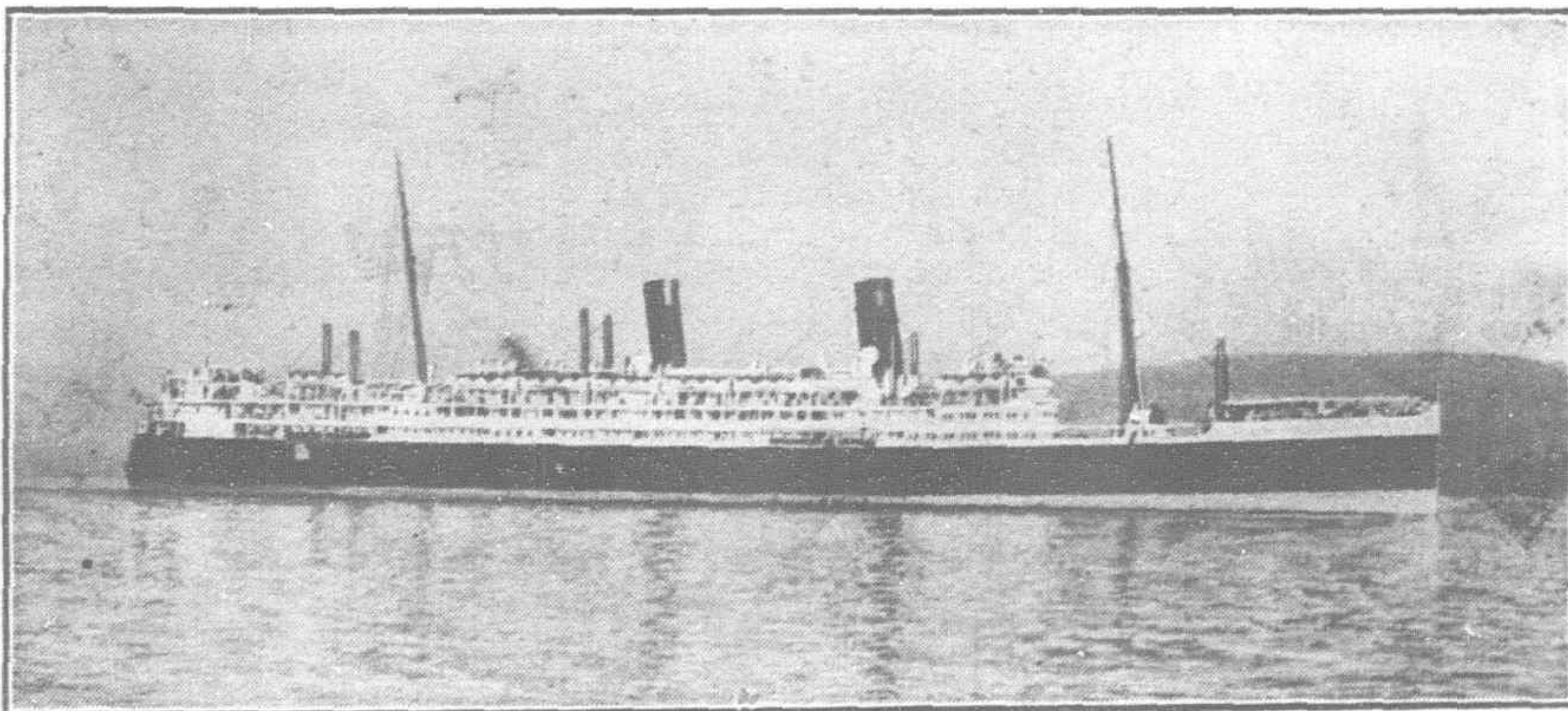
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Steam Engines, Air- and Gas Compressors, Upright Watertube Boilers, Cornish and Lancashire Boilers, High- and Low-Lift Centrifugal Pumps, Fans and Ventilators for all purposes, Stationary and Marine Diesel Engines, Airless Injection Diesel Engines, Ice-making and Refrigerating Plants, Maag Gears and Maag Planing Machines.



Motorliner "Aorangi" of the Union S.S. Co. of New Zealand, 23,000 tons. 13,000 BHP. 4 Sulzer-Fairfield Diesel Engines.

WINTERTHUR. SWITZERLAND.

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